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AGRICULTURE, RURAL DEVELOPMENT AND RELATED AGENCIES APPROPRIATIONS FOR 1987

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE

COMMITTEE ON APPROPRIATIONS

HOUSE OF REPRESENTATIVES

NINETY-NINTH CONGRESS

SECOND SESSION

SUBCOMMITTEE ON AGRICULTURE, RURAL DEVELOPMENT AND RELATED AGENCIES

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PART 4

AGRICULTURAL PROGRAMS

	Page
Commodity Futures Trading Commission	1
Economic Research Service	189
Agricultural Research Service	323
Cooperative State Research Service	569
Extension Service	827
National Agricultural Library	935

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AGRICULTURE, RURAL DEVELOPMENT AND AGENCIES APPROPRIATIONS FOR 1987

THURSDAY, MARCH 13, 1986.

COMMODITY FUTURES TRADING COMMISSION

WITNESSES

SUSAN M. PHILLIPS, CHAIRMAN, COMMODITY FUTURES TRADING COMMISSION

MOLLY BAYLEY, EXECUTIVE DIRECTOR, COMMODITY FUTURES TRADING COMMISSION

RUSSELL CHERRY, BUDGET DIRECTOR, COMMODITY FUTURES TRADING COMMISSION

Mr. SMITH. This afternoon we have the Commodity Futures Trading Commission. And we have with us the chairwoman of the Commission, and we are glad to have you. You may introduce whoever is with you.

Ms. PHILLIPS. Thank you very much, Mr. Chairman, and members of the subcommittee. I appreciate the opportunity to appear before you today to summarize the request of the Commodity Futures Trading Commission. I am accompanied today by Molly Bayley, the Executive Director of the Commission on my left, and by Russell Cherry, the Budget Director for the Commission.

We have a full statement, which I would request that we submit——

Mr. SMITH. We will insert it in the record.

BUDGET REQUEST

Ms. PHILLIPS. I would like to highlight the Commission's budget request for you.

For fiscal year 1987, we are requesting $30.4 million. This is an increase of $2.4 million over the post-fiscal year '86 Gramm-Rudman-Hollings level. This level will allow us to meet our increases in fixed obligations and to fund 508 staff-years. This is an increase of 15 over the fiscal year '86 level of 493. Both the 1986 level and the proposed '87 level are below the Commission's 1985 level of 533.

So the Commission's staffing level has decreased, and it really has not kept pace with the growth in the industry. Over the past eight years, the Commission's staff level has increased about 17 percent, while volume of the industry that we regulate has increased over 300 percent.

In addition to this increasing level of activity, the Commission is increasingly facing more complicated kinds of issues. Because of the new contracts that are now trading in the commodities area, we are now keeping up with the cash market activities in a variety of commodity markets.

In addition, the internationalization of the markets is requiring that we work with foreign countries, because some of our exchanges are trading through linked relationships with exchanges in other countries.

The Commission, I think, has been able to accommodate industry growth and industry development with a reduced staff level by increasing our productivity, by automating certain of our functions, streamlining programs, working with the states to get them involved in enforcement actions that now come within their jurisdictions, and also delegating certain functions to the National Futures Association.

REAUTHORIZATION PROCESS

Both 1986 and 1987 are going to be particular challenges for the Commission. As you may know, the Commission is currently undergoing the reauthorization process, and our request to the Congress for reauthorization is not a long list. It would clarify and strengthen our enforcement and litigation authority, make the Commission's oversight of NFA comparable to our oversight responsibilities and capabilities with respect to exchanges. And also, we would remove leverage transactions from our exclusive jurisdiction.

Perhaps most importantly, we are asking that the Commission's authorization be extended for six years, until 1992.

None of these requests will extend or expand the Commission's jurisdiction. In some areas it will reduce our regulatory responsibilities and allow us to streamline some of our operations, both regulatory and with respect to enforcement and litigation.

AUDIT TRAIL

Another major project that is ongoing in 1986 and will probably stretch into 1987, is our implementation of the Commission's audit trail proposal. In January of this year, the Commission unanimously passed an audit trail requirement. We are asking that the actual time of execution for each futures and options transaction be recorded on exchanges trade registers in increments of no more than one minute. This rule goes into effect in October of this year. So we do believe that the exchanges have ample time in order to prepare their systems. And a number of new proposals and systems are being contemplated by the exchanges at this time.

In addition to reauthorization and audit trail, the Commission has a number of other ongoing projects that are taking up a good deal of our time, including a major review of capital requirements, ongoing contract designations and enforcement responsibilities.

We also have several active advisory committees that are looking at some of our existing programs, and are even making recommended changes for new programs or changes to existing programs.

In conclusion, the Commission requests a Fiscal Year 1987 appropriation of $30,418,000 to carry out our responsibilities under the Commodity Exchange Act. The Commission takes pride in its ability to accomplish a great deal with a few resources, and we expect to make great strides at the requested level for 1987.

Thank you very much, Mr. Chairman. I will be glad to answer any questions from members of the subcommittee.

[CLERK'S NOTE.—The full text of Ms. Phillips prepared statement appears on pages 66 through 70. The explanatory notes appear on pages 71 through 188. Biographical sketches follow:]

CHAIRMAN SUSAN M. PHILLIPS

President Reagan renominated Dr. Susan M. Phillips to continue as CFTC Chairman when her initial term as Commissioner expired in April 1985. She was confirmed by the Senate and was sworn in as Chairman on October 23, 1985 by Supreme Court Justice Sandra Day O'Connor, having been sworn in as Commissioner the previous day by fellow Commissioner Kalo Hineman.

A CFTC Commissioner since November 1981, Dr. Phillips was appointed Acting Commission Chairman to replace retiring Chairman Phillip McBride Johnson on May 2, 1983. She was sworn in as Commission Chairman on November 17, 1983.

Dr. Phillips left the position of associate vice president of finance and university services at the University of Iowa, where she had also served on the finance faculty, to join the Commission. She has been an economic policy fellow at the Brookings Institution.

Dr. Phillips earned a B.A. degree in mathematics and economic from Agnes Scott College in 1967, an M.S. in finance and economics in 1971 and a Ph.D. in finance in 1973 from Louisiana State University. Dr. Phillips also was initiated into Beta Gamma Sigma at Louisiana State University and Phi Beta Kappa at Agnes Scott College. Her areas of specialization as an economist, in addition to options and commodity futures, include financial management and the economic theory of regulation. She is the author of numerous articles as well as coauthor, with J. Richard Zecher, of *The SEC and the Public Interest,* which was published by MIT Press.

MOLLY G. BAYLEY

Molly Bayley became Executive Director of the Commodity Futures Trading Commission in April 1984. Prior to joining the Commission staff, Mrs. Bayley was an employee of the National Association of Securities Dealers (NASD) for more than 13 years. From 1979 to 1984 she served as Vice President of NASDAQ Operations.

Mrs. Bayley is a director on the board of the Association of Junior Leagues, Inc. Mrs. Bayley served the Junior League of Washington, D.C. as Vice President from 1981 to 1982 and as President from 1982 to 1983.

A native of Spokane, Washington, Mrs. Bayley received her B.A. from Wellesley (Mass.) College in 1967 and later engaged in graduate study at Springfield (Mass.) College in 1979. Mrs. Bayley currently lives in Washington, D.C.

J. RUSSELL CHERRY

Mr. J. Russell Cherry was appointed Director, Office of Budget and Fiscal Operations, Commodity Futures Trading Commission, in November 1985.

Mr. Cherry, a native of New Jersey, began his professional career in 1971 following graduation from the Coast Guard Officers Candidate School, Yorktown, Virginia. From 1971–1975, he was assigned to Coast Guard Headquarters as a recruiting officer and as a White House Social Aide. Upon release from active duty he joined Peat, Marwick, Mitchell & Co. where he was a senior management consultant specializing in weapon system acquisition support until 1979. He joined the Colonial Penn Group (Philadelphia, Pa.) in 1979 as a senior corporate planner. In late 1979, Mr. Cherry took a civilian position with the Office of Engineering at Coast Guard Headquarters as a supervisory program analyst. From 1981 until his joining the CFTC, he was the financial manager for the Coast Guard's Office of Command, Control and Communications.

Mr. Cherry received a Bachelor of Science degree from the University of Tennessee in 1970. In 1976 he was awarded an MBA in International Business from the George Washington University.

Mr. Cherry is currently a lieutenant commander in the U.S. Coast Guard Reserve and is a certified public accountant in Washington, D.C. He actively participates in and holds leadership positions in numerous professional organizations.

He, his wife, Barbara, and their two sons, Mark and Michael, reside in Annandale, Virginia.

CONTRACT MARKET DESIGNATIONS

Mr. SMITH. How many contract designations do you have at the present time?

Ms. PHILLIPS. Total number of designations?

Mr. SMITH. Yes.

Ms. PHILLIPS. I think the total number that we have designated is about 190. But I think there are about 100 actively trading.

Mr. SMITH. Do you have some pending?

Ms. PHILLIPS. Yes, sir, we do.

Mr. SMITH. How many do you have pending?

Ms. PHILLIPS. We have 35 futures contracts pending, as of yesterday. Now they may have submitted some more today. And seven options contracts.

Mr. SMITH. Well, do you still take the position that you have to approve designations if they meet certain minimum requirements?

Ms. PHILLIPS. If they pass the standards of the economic purpose test and the terms and conditions reflecting with the cash market. Yes, that is how we have been proceeding, yes, sir.

Mr. SMITH. Well, now as you mentioned, you had an explosion in this industry, 300 percent increase in volume, with only a 17 percent increase in personnel. We have got Gramm-Rudman now, and as much as some people may think that increased funding for your agency, which is relatively small compared to other regulatory agencies with this kind of volume, may be justified, it is going to be terribly difficult this year to get anybody above a freeze. I mean, in dollars. That is just the fact of the matter. Because right away, if anybody is above a freeze level, they start saying, well, you have got to be a very, very special case.

If you do not get any more money, what would you do? Are you not going to at some point have to have some additional criteria for designation? Somehow you have got to cut off your volume of work, have you not?

Ms. PHILLIPS. Well, I think what happens is that there is a slowup in the approval process because of a shortage of resources.

CONTRACT APPROVAL PROCESS

Mr. SMITH. Well, I think nobody would object if you put as your lowest priority approving new contracts. Now that may be—there may be some contract that is very worthy and ought to be approved. But if you do not do that, it seems to me you are going to have the alternative, either you are going to spread yourself thinner and not do as good a job, or else you have got to not have as many contracts.

Ms. PHILLIPS. The Act does say that we must designate if it meets certain standards; it is a licensing kind of requirement. I think that we have been able to accommodate the growth in the markets by also getting the exchanges to take on increased responsibilities in

the surveillance area, and also mechanizing some of our surveillance operation.

The other problem with cutting off the flow of new contracts, of course, is that while we approve a number of contracts, not all of them are successful contracts. For example, in the last three years, we have approved I believe over 90 contracts, but only a fraction of those have proved to be successful.

So, just because we are continuing to approve all of them, does not necessarily mean that they successfully——

LOW VOLUME AND DORMANT CONTRACTS

Mr. SMITH. What happens to one that is not successful? Do they ever withdraw?

Ms. PHILLIPS. Yes, they do.

Mr. SMITH. I see.

Ms. PHILLIPS. The exchanges either delist them or deboard them. And in fact, we have put into place a rule for low volume and dormant contracts, so that if the contracts fall below a certain point for a period of time, they are deemed to be dormant. So instead of our having to go through a process to deboard them ourselves, they automatically get deboarded.

Mr. SMITH. Now with regard to the audit trail. You are in the comment stage now, are you?

Ms. PHILLIPS. No, sir. We have passed the final——

Mr. SMITH. You passed the final one?

FINAL RULE ON AUDIT TRAIL

Ms. PHILLIPS. A final rule. And the rule goes into effect in October.

Mr. SMITH. I did not say that right. It is not in effect yet?

Ms. PHILLIPS. That is correct.

Mr. SMITH. Now is it possible that it will be changed before it goes into effect or not?

Ms. PHILLIPS. We are not contemplating a change.

Mr. SMITH. I see.

Ms. PHILLIPS. I think what you may be referring to is that we have asked the exchanges to tell us by July 1 how they plan to come into compliance. And so there is a kind of pushing and hauling going on at the current time.

Mr. SMITH. Well, this audit trail thing, is complicated and many people do not understand it. But more people are using futures and more people are understanding it every week.

I remember when the Act was first enacted. That was one of the things that we wanted to do was to do something about self-dealing at the same time you are dealing for somebody else, and making sure they did not give themselves the preferred opportunity.

And so they said, well, no, we cannot do it now. Do not have the equipment. Put it off. So then we have an authorization and then they say, well, we have got to have another study. Four years ago, same deal again. Got to have another study.

It has just gotten to where something has got to be done about this. More and more people are concerned that they are being represented fairly. They are sitting out in Des Moines, Iowa depending

on somebody in that pit to deal for them when at the same time he is dealing for himself.

And if there is not an adequate audit trail to determine what goes on in the pit, I think they are going to lose confidence in using the futures markets, and they ought to. I just think that you have just got to go forward on this. It is the most significant thing you have done, as far as I can see.

I have been disappointed in CFTC in many respects. Even though I was an original sponsor of CFTC, I have even considered the possibility that it ought to be put under SEC, a view which we successfully resisted at the time the CFTC was created.

I just think that insuring an accurate audit trail is the minimum that you have got to do if you are going to remain as an active organization. I hope that you keep in mind your responsibilities, not just to the people you are listening to from the exchanges, but also from the people out there who are depending on the futures to giving them some kind of an opportunity to hedge a little bit.

I am not talking about speculators now. I am talking about people that need it in order to hedge.

GOALS OF AUDIT TRAIL

Ms. PHILLIPS. I could not agree with you more. And might I add, the Commission was unanimous in taking this step.

Technology has improved vastly since the Commission last looked at the audit trail issue. And we heard from a number of farm organizations, for example, that were most supportive of the need for improved audit trails.

The problem that you mentioned, trading ahead of the customers, is one goal; but also, intra-day speculative limit violations and manipulation.

Mr. SMITH. Yes, I understand what the exchanges have proposed and the way they are wanting to implement it, it would not even give you an assurance that you would know whether they traded ahead or not.

Ms. PHILLIPS. You mean, the two large exchanges in Chicago that have made a preliminary proposal?

Mr. SMITH. Yes. Their proposal would not assure you that you would know that from their audit trail, would it?

Ms. PHILLIPS. Well, based on the representations they have made, we should be able to determine trading ahead violations.

SEQUENCING TRADES

Mr. SMITH. Well, they still would only be making projections when the price changed, would you not?

Ms. PHILLIPS. No, they are sequencing their trades, in addition.

Mr. SMITH. Would you know each individual—would you know, if 30 people changed their price at the same time, would you know which one changed first and which one second?

Ms. PHILLIPS. You may not know that.

Mr. SMITH. And which order they traded in?

Ms. PHILLIPS. But as a back-up, what you would have is that each trader is sequencing his orders.

Mr. SMITH. Well, I just think you have got to be sure that these people that trade ahead—

Ms. PHILLIPS. Again, Mr. Smith, I agree. And the proof is in the pudding as to whether or not these systems work. The Commission is being very insistent on its capability to be able to monitor and audit these kinds of systems.

Mr. SMITH. As a matter of fact, I think that if you do not get a satisfactory audit trail implemented, I think that what is going to happen is that you are going to have to prohibit people from trading for their own account if they are going to trade for other people. I think they have got the choice, and they ought to face up to it.

Mr. Myers.

Mr. MYERS. Well, thank you, Mr. Chairman. And I apologize to my colleagues and to the witnesses for not being here earlier. After our floor action here with the supplemental, I had some young people from Owen County in Indiana who are here with the Close-up organization and their teacher. So I spent a little time with them in deference.

But I share the concern that the chairman is expressing here about CFTC. Have you ever thought about making Congressmen illegal or uneligible, or make it a crime for us to participate in commodity futures trading? I wish you would.

Ms. PHILLIPS. No, sir, we have not considered that.

Mr. MYERS. It would save me money. [Laughter.]

Ms. PHILLIPS. I will be glad to take that under advisement personally.

Mr. MYERS. When we do not have willpower, you know, you could help us. Everybody has got a——

Mr. SKEEN. The market needs guppies.

Ms. PHILLIPS. No comment.

Mr. MYERS. Well, I am a gullible guppy, I tell you.

Well, I think, I share some of what I heard of your colloquy with the chairman on other remarks here as follows, as the audit trail. I wondered what was causing my losses, and now I am beginning to think maybe somebody was manipulating. Is that what you are saying here? That there might be somebody playing the game besides——

Here I get into it legitimately.

Mr. SMITH. They get two offers, they take the more fair one for themselves and give you the other.

Mr. MYERS. I thought that all the way along.

How do you catch them at it?

Ms. PHILLIPS. Well, that is exactly why we would like to have better audit trails; so that if these abuses do occur, we can bring appropriate cases. And the exchanges can also bring disciplinary action.

USER FEE

Mr. MYERS. Will they pay for it? Are you going to have a user tax so that those of us who do use the system will pay for our protection?

Ms. PHILLIPS. There are, as you know, commissions charged to customers but we are not contemplating a user fee.

Mr. MYERS. Yesterday we—the Congress passed—not with my help—a provision for lie detector tests be given as one of the conditions, I believe, for employment. And also without any justification or any accusations you can call an employee in and put him through the test.

Does CFTC, will you be in that provision? I do not recall whether they were covered or not. Are they exempt?

EXEMPTION FROM LIE DETECTOR TESTING

Ms. PHILLIPS. I do not know that we are exempt. I have not looked at the legislation. I will be glad to look into it and let you know, if you would like.

Mr. MYERS. Okay, you just might for the record provide that.

Ms. PHILLIPS. I would be glad to do so.

[The information follows:]

As I understand the bill, it specifically excludes the application of the Act to employees of the Federal Government. I presume, therefore, CFTC employees could be required to submit to lie detector testing if such a policy were adopted by the Federal Government.

Mr. MYERS. I did not vote for it. I do not like the idea of making that a condition without any charges being brought. If the charges have been brought, okay. But just to make it willy-nilly so anybody can ask any question that they want to as a condition of employment, or call any employee up if they would like to ask questions, I just did not like the procedure.

But, you have not had too much trouble with this subcommittee on appropriations. But reauthorization this year, you may have some difficulty. I suppose you are anticipating this, and that is not——

Ms. PHILLIPS. It is a challenge.

Mr. MYERS [continuing]. The primary concern of this committee. Of course, we have to vote on those, too, in the House, not only just for appropriations.

But of course, you can help us a lot by the job you are doing, and you have done a good job. And I still have faith, one of these days, I am going to catch up.

Ms. PHILLIPS. I appreciate that, Mr. Myers.

Mr. MYERS. Thank you very much.

Ms. PHILLIPS. Thank you.

Mr. SMITH. Mr. Durbin?

Mr. DURBIN. Thank you, Mr. Chairman.

Thank you for your testimony today. Of course, being from the State of Illinois, I have more than an average interest in this particular area. I would readily concede that, like my colleague from Indiana, I have suffered the same fate in the commodities market and I will now leave it to the experts. I have visited the exchange and I find it hard to understand how real business is conducted in that pandemonium. But I assume that it is.

Mr. MYERS. They visit us and wonder the same thing.

Mr. DURBIN. Yes, I am sure. [Laughter.]

There are fewer of us and we do not wear colored coats. That is the only difference I can see.

Mr. MYERS. And we know what we are doing most of the time.

EXCHANGE SUBMISSIONS UNDER AUDIT TRAIL

Mr. DURBIN. The question I have relates to this whole question of audit trails. As I understand it, after you promulgated the rule in January, it was up to the exchanges within a certain period of time to submit to you what they felt would be a system that would comply with your rule.

I also understand that sometime in February, both exchanges, the Board of Trade and the Mercantile Exchange in Chicago, submitted their audit trail system for your consideration.

Can you tell me, at this point, where that is, and when you might be making a decision on their proposal?

COMPUTERIZED SYSTEM

Ms. PHILLIPS. What they have submitted to us is a description of how they contemplate the system will work. I have been out to Chicago, myself, and they have sent staff back to Washington, so there has been a lot of communication on this, to try and understand how the system will work.

Now technically, of course, they do not really have to submit anything to us until July. But because it is a computerized kind of system and it is going to take a fair amount of development and it costs a fair amount of money for them to implement, we have agreed to start looking at pieces of the proposal as they develop it.

What we have told them is that we believe that, based on what we have seen, and their representation as to how it will work, we think it has the capability of meeting the requirements of the rule.

Now of course, once they get it implemented, if it does not meet all of those standards that even they thought it would meet, we would be willing to work with them to try and get it shored up, so to speak. If its accuracy is not what they currently anticipate, the accuracy can be improved.

But I see that as an ongoing compliance arrangement that is normal, with respect to a regulator and one of its regulated entities.

APPROVAL OF EXCHANGE SUBMISSIONS

Mr. DURBIN. I would think that their initial concern is your threshold decision that their system, their audit surveillance system, meets the basic requirements of your rule. How soon do you think you will be able to advise the Board of Trade and the Mercantile Exchange whether or not their system does that?

Ms. PHILLIPS. We have indicated to them in public forums that we believe the concept has that capability. I suppose this, too, being a public forum, is another way of announcing that.

In terms of formally notifying them, we would not really anticipate a final approval, of course, until all of the specifications and so on are submitted to us. But we can, and I think we should in view of the kind of system that it is, give them a preliminary ap-

proval of the concept and encourage them to move forward, which is what we have done.

Mr. DURBIN. You feel that you have already given them that preliminary approval?

Ms. PHILLIPS. Yes, I do.

Mr. DURBIN. Excuse me, as a layman, for not understanding all of the complexities of the situation. But if I follow you, you believe the system that they are proposing meets the basic rulemaking requirement?

Ms. PHILLIPS. We think it has the capability of meeting the rule.

Mr. DURBIN. The capability?

Ms. PHILLIPS. Yes.

SYSTEM TESTING

Mr. DURBIN. You went on to say that once the system is in place, you would then test it to make certain it meets these requirements, and they may have to change some aspect of it so they would be, in fact, in full compliance. They would have to make a commitment, once having received your initial approval, to go put the system in place and to start up?

Ms. PHILLIPS. Yes, start it up. Let us see how it works.

Mr. DURBIN. And then you will monitor it?

Ms. PHILLIPS. Yes. We do that with any of their various programs—for example, their surveillance, large trader tracking system. That is really a normal procedure for how we would operate in an oversight capacity, with respect to an exchange.

Mr. DURBIN. At this point, they would go forward with the computerized system, cooperating with you to make certain that, however it is implemented, it conforms with you rule?

Ms. PHILLIPS. Yes. And I am hopeful that they will go forward with it. They, of course, have a good deal of implementation to move forward with.

Mr. DURBIN. And from what you have seen, the elements of that system meets your CFTC rulemaking requirements?

Ms. PHILLIPS. Again, their plan has the capability of meeting it, but we are really not going to know until it is actually up and running.

TESTING PERIOD

Mr. DURBIN. Is there any kind of a time frame for that testing period, when you will make a decision as to whether it is in compliance?

Ms. PHILLIPS. Oh, goodness. The rule actually goes into effect in October and with a system this complicated, I suspect they may even request an extension for implementation. And if they are making good progress, we would be willing to grant such an extension.

So I would not anticipate that they will be up and running for another year. And then, of course, we would be looking at it periodically. In addition, I would expect them to phase it in and do some testing and, of course, the Commission and the staff would be willing to be with them as they do this, in terms of giving them suggestions and so on.

CAPITAL RULE REQUIREMENTS

Mr. DURBIN. Switching to another topic, could you give me a layman's definition of what the capital rule requirements are that you are proposing?

Ms. PHILLIPS. Yes. As you may know, about a year ago there was a default of a clearing member of an exchange in New York. That default occurred because several traders who were members of the exchange had written call options. The price of the commodity moved very substantially and they did not meet a margin call. The loss was so great that it brought the clearing member under.

Now because we are currently in a pilot program for options trading, this caused us to step back and take a look at whether or not the capital requirements which had been in place for a number of years with respect to futures were adequate when assessed against the risks of options trading.

It caused us to step back and to try to determine whether or not capital requirements are adequate to reflect the risk that is now being assumed by some firms in the options market. And in this particular case, we had three traders who were really all on one side of the market.

What we proposed was that there be an additional capital charge if the risk of a particular firm is concentrated on one side of the market in a particular commodity. I might say that that proposal was met with less than 100 percent enthusiasm but I think that people in the industry also recognized that the onset of options trading really changed the risk structure of firms.

And so once they started realizing what this was going to mean they, in fact, have—through various sources—asked us to extend our comment period to April 14. We are expecting to get some alternate proposals that will address the concern of risk being concentrated on one side of the market.

Mr. DURBIN. You are working with the exchanges on that?

Ms. PHILLIPS. Yes, we are.

IMPACT OF REVISION TO CAPITAL REQUIREMENTS

Mr. DURBIN. Will the net impact of this be to force some firms out of business or some to go abroad? Do you feel that is likely to occur?

Ms. PHILLIPS. I know that there was some feeling that a number of firms might "go out of business" under the first proposal. And I say quote because what it really means is that they may have to come up with additional capital. Now if they come up with additional capital, of course, they would not have to go out of business.

They could also not allow their customers or their members to take on such high risk positions. So there are a number of ways that adjustments could be made and avoid going out of business.

Nevertheless, I do think that if you are proposing a revision to capital requirements, the answer probably is yes, it is going to affect some people, but not necessarily put them out of business. And in some cases, it may mean that some firms put up more capital and some firms put up less capital. But the idea is to have the capital structure reflect the risk structure that the firm is facing.

And I might add that I think that a number of financial regulatory agencies are undergoing the same kind of thing, the banking institutions are looking at risk based capital requirements, also. So I would not say that the futures industry is alone in this area.

Mr. DURBIN. Thank you very much.

Thank you, Mr. Chairman.

Mr. SMITH. Mr. Skeen?

INCREASE IN VOLUME OF TRADING

Mr. SKEEN. Thank you, Mr. Chairman.

And Chairman Phillips, it is good to see you, again. We have come a long way with this Commission, I think, and it has been very interesting development.

I was particularly interested in your testimony that we have had a 300 percent increase in the volume of trade in the last—over what period of time? This is the last year, two years?

Ms. PHILLIPS. Eight years.

Mr. SKEEN. Eight years. That is very interesting.

An issue which has been a little disturbing to me—is that there is far more activity going on in the currency exchanges than there are in agricultural commodities—I know Mr. Smith—who has been a constant, sometimes critic, but also one who has a very avid interest in the way the trades are handled and so forth. And I share his concern.

AGRICULTURAL VOLUME

What would you estimate now is the volume of the exchange—or the difference between the currency and the real agricultural commodities?

Ms. PHILLIPS. As I recall, the agricultural commodities are in the vicinity—it varies from month to month, quite frankly, depending on what is going on.

Mr. SKEEN. Surely, because of production months.

Ms. PHILLIPS. Yes, absolutely, and what is going on in the markets. But as I recall, agriculture now accounts for between 20 and 25 percent of total volume.

Mr. SKEEN. That is a very small percentage to—25 percent. The other 75 percent is what?

Ms. PHILLIPS. Well, it is the full gamut, currencies, interest rates——

Mr. SKEEN. But principally currency.

INTEREST RATES

Ms. PHILLIPS. Well, actually the biggest category is actually interest rates.

Mr. SKEEN. Interest rate exchange?

Ms. PHILLIPS. Yes, T-bonds, T-bills, Eurodollars.

Mr. SKEEN. But is mostly the financial end.

Ms. PHILLIPS. Yes.

Mr. SKEEN. Along with that then, I have to ask, too, I am a little disappointed that there is not any more participation. Of course,

with agriculture being in the economic situation that it is in I am sure that has had something to do with this, too.

The point I am getting at is that agricultural producers really are not using the markets, in my view, to the extent that they probably should have. And I am not discounting speculators. I think that they are necessary in the market as well.

Mr. MYERS. Thank you.

Mr. SKEEN. Well, we appreciate the money that you folks—I have been a donator, too. I have done a few Texas hedges in my time.

Mr. MYERS. I am a Texas hedger.

Mr. SKEEN. That means feed your own livestock, and then hedge them, and lose on both ends.

But that has been a real disappointment and I know that that is not your particular concern because you are a regulatory body, but then we have done a lot of work with the exchanges to try to increase interest.

How are agriculture's options.

AGRICULTURAL OPTIONS

Ms. PHILLIPS. You really have to look at the growth in agricultural volume over the period. While it has not been growing as fast as what has been going on in the financial area, there has still been increases in agricultural volume.

And in the options area, we have been very pleased to see increased participation particularly by the ag community directly in agricultural opitons.

And I think one of the reasons is the certainty. I mean, if they buy an option, they put up their money at that time, and then you do not have margin calls. It is more like a straight insurance policy.

So I think in terms of the structure of the contract agricultural options probably do have more promise for direct participation by farmers. And those have been actively growing contracts, soybeans and corn being the largest.

Mr. SKEEN. What kind of a rate did they draw?

Ms. PHILLIPS. Goodness. It has only been in effect—agricultural options—18 months now.

Mr. SKEEN. Almost two years.

Ms. PHILLIPS. Yes. And as I recall—I will have to get the exact figures for you.

Mr. SKEEN. Break down the volume of trading during the past 3 years among agricultural and non-agricultural commodities.

Mr. PHILLIPS. The annual volume of futures trading in agricultural commodities has declined both in absolute and relative terms during the past 3 years as the futures industry's growth has come from futures contracts in interest rate instruments, stock indices, foreign currencies and petroleum products. I am submitting for the record a schedule prepared by the Futures Industry Association that shows the volume of futures trading for various commodity groups.

[The information follows:]

FUTURES CONTRACTS TRADED BY COMMODITY GROUP

Rank—Commodity Group	Contracts	Percentage
1985:		
(1) Interest Rate	55,125,094	34.74
(2) Ag Commodities	39,331,754	24.78
(3) Equity Indices	22,243,167	14.02
(4) Foreign Currency	17,165,736	10.82
(5) Precious Metals	14,720,190	9.28
(6) Petroleum Products	7,002,107	4.41
(7) NonPrecious Metal	2,525,658	1.59
(8) Other	582,872	0.37
Total	158,696,578	100.00
1984:		
(2) Interest Rate	41,221,424	27.60
(1) Ag Commodities	48,860,126	32.71
(4) Equity Indices	18,442,464	12.35
(5) Foreign Currency	14,000,857	9.37
(3) Precious Metals	18,880,269	12.64
(7) Petroleum Products	4,619,533	3.09
(6) NonPrecious Metal	2,589,518	1.73
(8) Other	758,034	0.51
Total	149,372,225	100.00
1983:		
(2) Interest Rate	28,123,161	20.10
(1) Ag Commodities	57,829,242	41.33
(4) Equity Indices	12,752,937	9.11
(5) Foreign Currency	11,910,581	8.51
(3) Precious Metals	22,552,427	16.12
(7) Petroleum Products	2,776,355	1.98
(6) NonPrecious Metal	3,198,810	2.29
(8) Other	781,427	0.56
Total	139,924,940	100.00

Mr. SKEEN. What has been the growth trend in agricultural options since they began trading?

Ms. PHILLIPS. While all ten of the agricultural option contracts approved by the Commission are still being traded, the growth pattern among them varies considerably. In general the highest volumes have been achieved by the contracts traded on the larger exchanges. These have been the soybean option on the Chicago Board of Trade, the live cattle option on the Chicago Mercantile Exchange, and the corn option on the Chicago Board of Trade. These three contracts have had excellent growth in terms of volume and open interest. Most of the other agricultural options, however, experienced considerably less growth, apparently reflecting the prevailing climate for agricultural futures markets as a whole.

Mr. SKEEN. Are you satisfied that it is showing a—has struck the interest of the agricultural community and has grown with it? And that is what it was designed to do, I think, primarily.

REPORT ON OPTIONS PROGRAMS

Ms. PHILLIPS. Absolutely. And in fact, the Commission has up for consideration in a couple of weeks, the expansion of the pilot program. And as part of that, we submit a justification to the Congress on the program. And I will be happy to send you a copy.

Mr. SKEEN. I would like very much if you would make that available.

Ms. PHILLIPS. We go through the statistics and, in fact, discuss who is using these markets. And it has had broad participation.

Mr. SKEEN. And it is broken down by the various commodities?

Ms. PHILLIPS. Yes, it is.

Mr. SKEEN. Thank you very much.

Thank you, Mr. Chairman.

Mr. SMITH. Mr. Akaka?

Mr. AKAKA. Thank you very much, Mr. Chairman.

Madam Chairperson, it is good to have you here. It seems as though you are suffering expansion. You are asking for more money. Your volume of trading is up 300 percent, which is really a great responsibility.

I looked this over, looking for any comments on fraud, which I do not really find in here. And I was just interested in whether fraud is a growing problem in this field?

Ms. PHILLIPS. As the head of essentially an enforcement agency, I wish that I could say to you that we have stamped out all fraud. And in fact, the increase that we are requesting is to go to our enforcement and surveillance operations.

I will have to say that, yes, it is true that the number of enforcement cases that we are bringing certainly is increasing. I do not think, however, that it is proportional to the volume, because a lot of that volume is on exchanges that have their own disciplinary program.

So you may not necessarily expect that there will be a perfect parallel relationship between the growth of fraud and the growth of volume.

COMMON TYPES OF FRAUD

Mr. AKAKA. If you can, can you tell me what you might consider the most common types of fraud that you are encountering?

Ms. PHILLIPS. I think that in the enforcement area, I would have to look at brokerage-type fraud, commodity pool operators, churning, misuse of customer accounts, promising customers things that they cannot deliver. Incidentally, if a firm is promising a certain rate of return, that is fraudulent, and we would go after them.

I think most of the kinds of cases that we pursue have to do with being in the area of broker related problems and advisor related problems. And then off-exchange, boiler room type activities. What we would call off-exchange futures.

And to the extent that those kinds of cases occur, they may not be related to volume on exchanges.

RELATIONSHIP BETWEEN TRADERS' CONFIDENCE AND FRAUD

Mr. AKAKA. Is there a relationship in the commodities market between the traders' confidence and commodities fraud? I do not know whether you have sensed this.

Ms. PHILLIPS. Confidence in the market?

Mr. AKAKA. Yes. Traders' confidence.

Ms. PHILLIPS. I see what you are saying. Yes, I think that there is a certain amount of it. To the extent the problems are in off-exchange activities, and to the extent they are differentiated from

what we would call the legitimate kind of activity that is occurring on exchanges, yes, that is certainly the case.

And I think that NFA, the National Futures Association, has been very helpful in trying to—how shall I word it—publicize the fact and make it known to customers that if they are concerned about who it is they are doing business with, check with the CFTC, or check with the NFA to find out if they are registered entities. And then they would have a better idea of who it is they are dealing with.

So I think that that kind of effort is very important. And we have been pursuing that with NFA.

VALUE OF CUSTOMERS' FUNDS PROTECTED

Mr. AKAKA. I also understand that your budget request will be used to uncover and investigate allegations of commodities fraud.

Is it possible for you to calculate the dollar amount that—the value of the fraud uncovered, compared to the dollars expended in this kind of operation and investigation?

Ms. PHILLIPS. One calculation we do is dollars of customer funds that are recovered. So that, for example, if we hear allegations of fraud with respect to a particular firm, we would go into court and seek to have that firm put into a receivership. And a receiver would oversee the distribution of the assets.

So there is that kind of comparison. If it is not contained in our budget documents, I will be happy to supply it separately.

Mr. AKAKA. Yes, will you please supply it for the record?

Ms. PHILLIPS. Yes.

[The information follows:]

Almost $15 million of customer funds and other assets were placed under the protection of 11 equity receivers appointed in FY 1985. In addition, orders were obtained requiring disgorgement of in excess of three and one half million dollars for return to customers. Further, the initiation of an injunctive proceeding in itself has frequently resulted in the defendants ceasing all business operations, thereby safeguarding against additional customer investment.

SELF-REGULATION

Mr. AKAKA. There has been also a strong trend towards self-regulation of the commodities trading industry. In your opinion, do you think this trend will continue to grow? And if so, what areas of self-regulation will you expect to expand?

Ms. PHILLIPS. That has been a very active area for us in the last few years, since NFA has come on-stream. And we have delegated to them our registration responsibilities and certain auditing responsibilities of firms.

So our goal really has been to move to more of an oversight capacity so that there is a self-regulatory organization dealing directly with members. And then we are looking at the operations of the self-regulatory organization.

I think registration and auditing have been the big areas that have allowed us, in fact, to accommodate some of the industry growth. That has relieved the Commission of some of its responsibilities.

I think that in terms of what additional task NFA can take on, that is going to be a little more difficult. They can take on a few

more of our auditing kinds of responsibilities, review of financial statements, that kind of thing, of brokerage houses. But there is going to be a limit as to how much we can pass to them.

Now exchanges, I think, that there probably is more that the exchanges—the self-regulatory organizations can do. And I must say again, that the audit trail, I think is a vital and integral part of our ability to rely on the exchanges to bring disciplinary action for certain kinds of violations.

So I think we will be looking more to the exchanges with respect to certain kinds of disciplinary actions, recordkeeping, perhaps even in the surveillance area.

COST SAVINGS OF SELF-REGULATION

Mr. AKAKA. I know you have moved deeper into this self-regulation area because of anticipated cost savings. Do you have an idea of what the savings may be?

Ms. PHILLIPS. Well, we did, with respect to NFA, do a study at the direction of the Congress. Of course, they wanted us to do a lot of things, but one of the things—pieces of that study was to determine what kind of savings NFA has resulted in.

And as a direct savings, it has been about—NFA we estimated saved us about three and-a-half million dollars over the last few years. But they have, in addition, taken on a number of other kinds of responsibilities. And so it has also, perhaps, allowed us to refrain from asking for additional funding.

So it is not just direct savings, but it is also some indirect.

With respect to the exchanges, we have not made that kind of direct calculation. The exchanges, however, have increased their own compliance programs significantly. And their increased responsibilities, I think, are reflected in those costs. And I do not have those at hand, but I would glad to supply that to you also.

Mr. AKAKA. Yes, would you please do that. And I thank you very much for your responses.

Ms. PHILLIPS. Thank you, Mr. Akaka.

[The information follows:]

The Commission, as part of its program of ongoing oversight of exchange compliance efforts, conducts biennial reviews of exchange compliance programs. Biennial statistics compiled by the Commission since 1982 indicate continuous growth in exchange compliance personnel. Specifically, in 1982, the exchanges employed 211 compliance personnel. By 1984, the exchanges had increased compliance personnel to 231. The Commission expects the exchanges to increase their compliance staff in 1986 to 276, which will result in a 30.3% increase over the 1982 figures.

Mr. AKAKA. Mr. Smith.

TIMING OF TRADES

Mr. SMITH. Now as I understand it—is this right or wrong? I understand that the Chicago board and the Merc are proposing to implement your rule on audit trail by timing within 30-minute brackets. Is that correct? Computerizing their timing.

Ms. PHILLIPS. Computerizing their timing. They currently keep—they have all price changes. And those are timed as they occur. They will get other—use entry times and perhaps also exit times. I do not think that they have completely worked that out. But cer-

tainly use entry times and assign—and match up to the time and sales report all customer proprietary kinds of transactions.

The only ones that would not be separately matched would be the floor traders' time.

Mr. SMITH. I was going to say, I do not see how that complies with what we were talking about, about being able to determing whether a floor trader trades for himself first, particularly if some of his trades are opposite another floor broker.

Ms. PHILLIPS. Well, to the extent that you have a floor trader, and you have someone else on the other side, you would then be able to determine the time for that transaction. And separately, you are also getting the sequence of the floor traders.

And so relatively, you would be able to place the other—the rest of the times for the floor traders.

Mr. SMITH. Well, in the Kansas City board you can time sequence within one minute. What is the excuse for other exchanges not doing theirs within one minute? It can be done, obviously.

Ms. PHILLIPS. You are absolutely right. There are several exchanges that currently have one-minute timing systems, Kansas City, Minneapolis, and the New York Mercantile Exchange.

Mr. SMITH. Well, what is their resistance to the one-minute time sequencing?

Ms. PHILLIPS. Their resistance really has to do with the large volume in some of their pits relative to some of these other——

Mr. SMITH. Well, if you are going to be larger, you have larger volume, you have larger income. You know, you expect to have larger expenditures, I suppose.

Ms. PHILLIPS. I do not disagree with you. I think their feeling is that their transactions occur—a lot of them in a minute; more frequently. And to have the traders write down the times, they think will deter liquidity.

Now, so what they are proposing to do is be able to reconstruct the sequencing via all of these other pieces of information.

Mr. SMITH. But can they do that?

Ms. PHILLIPS. Well, I think that is our concern, in a sense. While we can encourage them to go ahead with the concept, if it does not perform as well as they anticipate that it is going to, then I think we have to go back and ask them to shore it up.

SYSTEM IMPLEMENTATION

Mr. SMITH. I do not see how they can reconstruct it satisfactorily.

But in addition to that, the only other thing I want to say is, I thought your answers concerning how fast it was going to be implemented sounded to me like it might be rather slow. Is that a fair characterization or not?

Ms. PHILLIPS. I think that with a large computerized system, I would anticipate that it is going to take them a while.

Mr. SMITH. You were projecting something like over a year.

Ms. PHILLIPS. And they have projected about a year, too.

Mr. SMITH. Yes. Any other questions?

Mr. MYERS. Thank you, no.

Mr. SMITH. Chairman Whitten, Mrs. Smith and Mr. Watkins have a series of questions they would like answered for the record. Thank you very much.

Ms. PHILLIPS. Thank you very much.

STUDY ON EFFECT OF EMBARGOES

Mr. WHITTEN. In the Committee's report on the fiscal year 1986 Appropriation Bill we asked the Commission to conduct a study of the effect on hedgers in futures markets during the last decade as a result of embargoes on the sale of U.S. agricultural products. Has this study now been completed, and what did you learn?

RESPONSE. We are just in the beginning stages of the study and will keep the Committee apprised of our progress.

POLICY CHANGES

Mr. WHITTEN. Would you please describe for the Committee some of the major or significant policy changes that you have instituted within the last year?

RESPONSE. During FY 1985, the Commission approved the first options on agricultural futures contracts pursuant to its authority under the Futures Trading Act of 1982. The Commission also licensed the first leverage commodity firms under the 1982 legislation, and completed the transfer of most registration processing to the National Futures Association.

A major policy proposal issued in FY 1985 and finalized by the Commission in FY 1986 was the improvement of exchange audit trails for market surveillance and enforcement purposes. The final rules require each contract market to meet a performance standard for recording the time of trades in increments of no more than one minute intervals. The Commission is currently working with the exchanges in order that they may meet the October 1, 1986, deadline for compliance. These rules will facilitate reconstruction of trades in a more accurate and timely manner.

In addition, the Commission investigated and prepared a special report on the failure of Volume Investors Corporation. This report led to the preparation of three proposed rules on minimum financial requirements for futures commission merchants and on the default or bankruptcy of exchange and clearing member firms. Comments on the liquidation and margin proposals are currently being reviewed. The comment period on the proposed capital rules has been extended through April 4, 1986.

TRANSFER OF REGISTRATION

Mr. WHITTEN. Would you please give the Committee a full report on how the transfer of the registration functions to the National Futures Association has progressed, and what impact has this transfer had on the workload of the Commission?

RESPONSE. As you will recall, the Commission completed the transfer of its registration processing functions for all categories of registrant except floor brokers, leverage transaction merchants and the associated persons of leverage transaction merchants in December 1984. The Commission examined in some detail NFA's performance of these functions and the impact on Commission resources in conjunction with its Report to Congress on NFA. I would therefore like to provide for the record a copy of the pertinent portion of our Report which was completed in December 1985.

More recently, on September 30, 1985 the Commission authorized NFA to take adverse actions against applicants and registrants for whom it had registration authority. It is premature to have assessed NFA's performance in this regard or to assess fully its impact on Commission resources.

Finally, I would note the NFA, in coordination with the Commission, has been working with the several exchanges to develop a proposal to transfer the processing of floor broker registration applications to NFA. In this connection, sufficient progress has been made that the NFA Board of Directors has formally agreed to request authorization to perform this function, subject only to the agreement of the exchanges. The Commission is hopeful that agreement on this matter will be reached shortly and has advised NFA that, upon agreement, the Commission would look to transfer this authority to NFA by October 1, 1986.

[The information follows:]

REGISTRATION

To promote the evolution of self-regulation in the commodities industry and to permit the Commission to move to an oversight role in connection with the registration of commodity professionals, Congress in 1982 adopted amendments to the Act recommended by the Commission to facilitate the transfer of the Commission's registration functions to NFA. As the Commission program that most directly affected the greatest number of industry professionals, it was essential that it be conducted in a manner responsive to the industry's needs. Yet, since the creation of the Commission in 1974, the ever-growing number of individuals and firms subject to registration had increasingly taxed the Commission's resources devoted to this purpose. The number of registrants under the Act increased dramatically at the outset, with the addition under the 1974 legislation of commodity trading advisors, commodity pool operators and, most significantly, the sales personnel, or associated persons, of FCMs, to the two then-existing categories of registrant, FCMs and floor brokers. Thus, while in 1974 the number of registrants totaled 1,732, including 230 FCMs and 1,502 floor brokers, this number had risen by the end of fiscal year 1976, the Commission's first full year of operation, to 28,577, including 277 FCMs, 500 CTAs, 350 CPOs, 2,451 floor brokers and 24,999 associated persons.

The number of Commission registrants continued to expand along with the industry itself and, at the time of the Commission's most recent reauthorization hearings in 1982, there were 57,792 registrants in all — 390 FCMs, 1,497 CTAs, 727 CPOs, 4,678 floor brokers and 50,500 associated persons. In addition, the Commission was required to conduct fitness checks on an additional 18,703 individual principals of registrant firms. Commission registration procedures were also strengthened in 1982 with the

A. Requirements for an Effective Registration Program

Neither the Act nor the Commission's Order approving NFA's registration as a futures association established a time by which the transfer of the Commission's registration functions was to be effected. Both the Commission and NFA, however, anticipated that it would be completed well before, but certainly no later than, September 30, 1985. In that connection, a registration task force composed of Commission and NFA staff agreed that an effective registration program should satisfy several specific requirements which are the basis for the evaluation in this Report. The standards developed by the task force indicated an effective registration program should:

- Process registration applications efficiently and accurately;
- Conduct thorough and prompt fitness evaluations to exclude unqualified individuals and firms from the regulated commodity industry;
- Maintain the security of all registration records; and
- Provide accurate data to commodity regulators, federal and state regulatory agencies, self-regulatory organizations, and others, including the preparation of certifications of registration history for enforcement and other litigation purposes and the preparation of routine and special reports as required by the Commission. In this connection, the Commission has required NFA to be able to produce eighteen reports including: a report listing pending and deficient applications; a general disciplinary history report; an alphabetic directory of all firms; a listing of associated persons by sponsoring firm; a list of commodity pools; and a list of newsletters by name.

B. History of Implementation

With the adoption of the 1982 amendments to the Act, the Commission, in coordination with NFA, moved forward to effect the transfer of registration functions from the Commission to NFA. In April 1983, the Commission authorized NFA to process requests for no-action positions for "agents" of futures commission merchants, who were now categorized as introducing brokers, and for their associated persons in order to permit them to continue in business pending adoption of final rules governing the registration of

required to be a member or associate member of NFA. All registration-related forms, correspondence and data held by the Commission was transferred to NFA by November 30, 1984.

NFA implemented its associate member program for all associated persons of NFA member firms in August 1985. In coordination with the Commission, NFA developed a unified application form for registration and associate membership which also serves as an application for registration as a commodity representative at the four exchanges that have such a program. The transfer of registration functions with respect to these categories of registrant was completed in September 1985 when the Commission authorized NFA to conduct proceedings, subject to Commission review, to condition, deny, suspend, restrict or revoke registration.

NFA's registration staff has grown from 13 in April 1983, when NFA began to process no-action positions for introducing brokers and their associated persons, to approximately 56 by September 30, 1985, reflecting NFA's increased registration and membership responsibilities. During 1983 and 1984, NFA processed and granted registration to 700 introducing brokers and 2860 associated persons of introducing brokers and issued 735 temporary licenses to associated person applicants. In the first nine months of 1985, however, this workload grew substantially as a result of the additional categories, and NFA granted the following initial and renewal registration applications:

Futures Commission Merchants	415
Introducing Brokers	1018
Commodity Trading Advisors	563
Commodity Pool Operators	309
Associated Persons	11,987

During this period, NFA also issued 6264 temporary licenses to associated person applicants.

D. Evaluation of Registration Program

Based upon information obtained from this continued coordination and, in particular, from findings of an audit conducted by Commission staff in June and August 1985, the Commission has determined that NFA has met the minimum requirements established by the Commission in its October 9, 1984 Order authorizing NFA to perform the Commission's registration functions with respect to futures commission merchants, commodity pool operators, commodity trading advisors and their respective associated persons. Moreover, NFA has made significant progress in moving beyond these minimum requirements and in implementing an effective registration program.

- Registration Processing. As initially designed, the procedures for processing registration applications focused on accuracy to the detriment of efficiency. NFA relied heavily on manual procedures to prevent processing errors. Moreover, NFA's computer system, as designed, contained too much information on each data screen. As a result, although accuracy in the processing of applications could not be faulted, delays caused by the manual procedures and by the difficulties in interpreting the complex data screen made the system inefficient. In addition, because neither the manual nor the computer system provided a means whereby a chronological list of pending applications was maintained, significant backlogs developed.

  Drawing in part upon recommendations from Commission staff, the processing procedures have been revised. Manual processing steps have been streamlined and, where possible, automated, most notably in the areas of deficient application follow-up and automatic approval of AP applicants. Efficiency has been significantly improved without sacrificing accuracy. Thus, for example, while NFA initially needed four weeks to grant a temporary license to a qualified associated person applicant, temporary licenses are now issued within ten business days.

  NFA has also developed a manual to supplement the application instructions and thereby assist applicants in properly completing a registration application. Because delays in registration processing are often caused by inaccurate or incomplete registration applications, the manual should contribute to efficiency by helping to ensure that the applications are complete when first received by NFA.

- Providing Information. In virtually every area of this important element, NFA's registration program is meeting the standards which were established by the Commission in its Orders authorizing NFA to perform the Commission's registration functions for those categories of registrant that are members or associate members of NFA. Specifically:

the creation of these two categories of registrant in 1983, NFA relieved the Commission of the associated software development and processing costs. In addition, by providing personnel to process applications for temporary licenses, NFA was instrumental in instituting this important program. Indeed, the transfer of the registration program most likely would not have taken place when it did had the temporary licensing program not been implemented.

The transfer of registration functions to NFA nonetheless required the Commission to incur significant additional costs. Those costs were related to such preparatory activities as rule development, development of special computer software, modification of the Commission's systems of records under the Privacy Act, coordination with the Securities and Exchange Commission and the Federal Bureau of Investigation, development of procedures regarding appropriate disclosure or confidentiality of registration information, and other necessary arrangements.

Beyond questions of agency resources, the registration transfer has also produced significant benefits to the industry, most significantly as the result of registrants being saved the burden and expense of filing multiple applications. As of August 1, 1985, the application for registration with the Commission as an associated person also serves as the application for membership as an NFA "associate" and, in addition, as a registered commodity representative at the four exchanges that have such a requirement. Thus, many applicants for AP registration are now required to file only one application rather than as many as six. NFA is additionally engaged in discussions with the National Association of Securities Dealers to determine if similar relief can be afforded to those futures commission merchants which are also registered as securities brokers or dealers. The temporary

NFA'S ASSUMPTION OF CFTC FUNCTIONS

Mr. WHITTEN. Would you also describe for the Committee what functions NFA is assuming that had been previously carried out by the Commission?

RESPONSE. As you know, NFA has assumed most of the Commission's day-to-day registration responsibilities. The other principal area where the Commission has been able to shed a portion of its operational workload involves the financial and sales practice auditing of non-exchange member futures commission merchants and of introducing brokers, commodity pool operators, and commodity trading advisors. This is an area where no industry self-regulatory organization had previously taken responsibility. In the past, therefore, the Commission had to step in and fill the gap so that customers of these firms—and other industry participants with whom they did business—would not be unprotected. Now that NFA has taken over these direct responsibilities with the assistance of the exchanges, the Commission has been able to redeploy its resources to functions more appropriately performed by a government agency such as the Commission—in particular, surveillance, enforcement, policy development and oversight of NFA and the exchanges' various self-regulatory programs.

Mr. WHITTEN. Are any additional functions or responsibilities under consideration for transfer to NFA?

RESPONSE. As discussed earlier, NFA and the Commission staff have been engaged in extensive discussions about transferring the last of the Commission's registration processing functions to NFA. This principally involves the responsibility for floor registration, a subject in which the exchanges are obviously interested as well. As a result, NFA has been meeting with representatives of the contract markets in the hopes of securing their cooperation. We are optimistic that this will, in fact, take place as planned and that NFA will take over this task by the end of the fiscal year.

The only other function we contemplate delegating to NFA involves the review of the disclosure documents which, under the Commission's rules, must be filed with the Commission before they can be given to a potential customer by a commodity pool or commodity trading advisor. We are in the process of reviewing our internal procedures in this area now in order to minimize any differences between the way the Commission staff and NFA respond to particular questions that arise under those rules.

BOILER ROOM FRAUD IN CALIFORNIA

Mr. WHITTEN. There have been a number of articles in the press regarding the buildup of boiler room operations in Southern California. What efforts have you made to bring those operators under control?

RESPONSE. Mr. Whitten, the boiler room fraud problem in Southern California has been a serious concern of not only our Commission but also of numerous other federal and state regulatory and investigative agencies. The problem, as I am sure you are aware, is not limited to any single type of investment scam but rather encompasses as many different schemes as there are operators. Boiler room fraud with a commodity theme is only one of many types of illegal operations in Southern California. Other types include office supply scams, talent agency fraud, oil and gas lease schemes, phony real estate partnerships, unauthorized credit card use and COD-prize winner fraud, to name just a few.

As I noted, the Commission has been concerned about the commodity-related boiler rooms for some time. In order to stem the problem, the Commission has filed several injunctive actions in federal court and obtained ex parte orders freezing the remaining assets of the corporate and individual defendants. We have filed these cases ourselves as well as encouraged the State of California to join with us as a co-plantiff. We have routinely notifited the state and federal criminal authorities of new suspect operations as we have learned about them.

In December of last year a task force was set up to combat fraudulent investment schemes in Southern California. In addition to Commission enforcement staff, representatives of five federal agencies and four state and local agencies are working cooperatively to address this problem. I have attached a press release in which I announced our participation in and commitment to this project. Through this vehicle, a coordinated enforcement approach has been developed which has included information sharing, technical assistance, and simultaneous enforcement actions.

During the past four years, the Commission has conducted a number of cooperative enforcement seminars to inform state and federal officials about the problem

and to share with them various investigative and litigation techniques. On March 27, 1986, a special enforcement seminar will be conducted for the members of the task force by the Commission's Division of Enforcement in Los Angeles. The Commission's staff has provided both technical and expert witness assistance in a number of cases and will continue to do so.

[The information follows:]

NEWS RELEASE

Release: 2471-85

Contact: Kate Hathaway

For Release: Wednesday, December 11, 1985

(202) 254-8630

Washington--Susan M. Phillips, Chairman of the Commodity Futures Trading Commission, announced the Commission's Enforcement Division has joined with federal and state agencies in a task force designed to combat fraudulent investment schemes which have become rampant in Southern California.

The task force is comprised of representatives from six federal agencies and four state and local agencies, including the Commission, the United States Attorney's Office, the Federal Bureau of Investigation, the Securities and Exchange Commission, the United States Postal Inspection Service, the United States Secret Service, the California Department of Justice, the California Department of Corporations, the Los Angeles County District Attorney's Office, and the Orange County District Attorney's Office.

Chairman Phillips noted that joining the task force is the most recent step in the Commission's ongoing efforts to combat off-exchange violations including the creation within its Division of Enforcement of a State and Federal Liaison Unit to confront the off-exchange problem through prosecution of cases in cooperation with state and federal agencies, conducting seminars and serving as an information clearinghouse.

Phillips said the task force is a necessary response to the massive proliferation of boiler rooms in Southern California. The magnitude of the problem, she said, is evidenced by estimates that nearly one-third of all boiler rooms in the nation are located in Los Angeles and Orange Counties and are bilking the American public out of hundreds of millions of dollars annually.

Phillips said the goals of the task force essentially are to shut down as many boiler rooms as possible, to prosecute those persons involved, and to the extent possible, insure that restitution is made to victims. Phillips commented that a cooperative, multi-agency approach is necessary to achieve these ends because no single law enforcement or regulatory body has all of the jurisdictional authority, financial resources, or statutory tools which must be brought to bear on the problem.

As an example of the progress already made by the task force in combatting investment fraud, Phillips cited a recent injunctive action brought by the Commission and the State of California on December 3, 1985 against a precious metals boiler room known as First American Currency, Inc. and two of its principals. The defendants, operating out of Laguna Hills, California, were charged with the sale of off-exchange futures contracts in violation of the Commodity Exchange Act (Act), and with fraud in violation of the Act and California law. In connection with the filing of that case, the Postal Inspection Service and the United States Attorney's Office executed search

warrants against the defendants at their office.

As a result of that action, the defendants' assets have been frozen and a temporary equity receiver has been installed for the corporate defendant pending a hearing on the plaintiffs' request for a preliminary injunction.

In conclusion, Chairman Phillips indicated that CFTC Commissioner Fowler West with his long-standing interest in the fight against commodity fraud, would continue his work in the development of strong ties between the Commission and state officials.

FLORIDA BOILER ROOM OPERATIONS

Mr. WHITTEN. Other than Southern California, what areas of the country represent major problems as far as boiler room operations?

RESPONSE. Apart from Southern California, the only part of the country where the Commission has experienced major problems with boiler room operations is the State of Florida, especially Southern Florida. It must be mentioned, however, that as a result of Florida legislation and aggressive enforcement by Florida officials and the Commission, we have seen the problem there start to abate over the last few years. In addition, the Commission has brought some cases in Michigan and Texas, although we would not characterize these parts of the country as major problem areas.

IMPACT OF FARM ECONOMY ON FUTURES MARKETS

Mr. WHITTEN. Would you please describe for the Committee, in some detail, what impact the depressed farm economy has had on the trading in agricultural futures.

RESPONSE. The depressed farm economy has led to less active agricultural futures markets. Agricultural futures volume dropped from 48.9 million contracts in 1984 to 39.3 million in 1985. While the corn and soybean crops increased 15% and 13% respectively last year, futures volume declined 30% and 35% respectively for those commodities.

The depressed farm economy stems principally from declining export demand brought on by increased foreign competition. Formerly about 40% of U.S. agricultural acreage was used to produce exports. Since U.S. crop production has continued at very high levels relative to market demand, the federal government has had to purchase and store commodities in order to prevent even more severely depressed prices for farmers.

Reduced exports reduce the need for domestic and foreign merchants and processors to hedge their cash purchases, sales and inventories. Prospects for stable prices further reduce the need for commerical enterprises to hedge their commitments and the inducement for speculators to trade in agricultural futures markets.

OUTLOOK FOR AGRICULTURAL FUTURES

Mr. WHITTEN. How do you view the outlook for trading in agricultural futures over the next few years?

RESPONSE. We believe a resurgence of trading volume in agricultural futures will be tied to the resurgence of the U.S. agricultural economy. Once the world surplus of agricultural commodities is reduced to normal levels and domestic prices are no longer supported significantly above world prices by government support programs, agricultural prices will probably become more volatile as they reflect changes in international supply and demand conditions. This increased price volatility will provide inducements for hedgers as well as speculators to trade both agricultural futures and options in greater volume.

AGRICULTURAL OPTIONS CONTRACTS

Mr. WHITTEN. For the Record, would you please provide a list of all of the agricultural option contracts that are now traded?

RESPONSE. Since October 1984 ten agricultural option contracts have been approved by the Commission and listed for trading on six exchanges. I will submit the dates on which each agricultural option began trading.

[The information follows:]

AGRICULTURAL OPTIONS IN PILOT PROGRAM

Trading initiated	Exchange	Commodity
October 30, 1984	Chicago Mercantile Exchange	Live Cattle
October 30, 1984	New York Cotton Exchange	Cotton
October 31, 1984	Chicago Board of Trade	Soybeans
October 31, 1984	Kansas City Board of Trade	Wheat
October 31, 1984	Minneapolis Grain Exchange	Wheat
October 31, 1984	MidAmerica Commodity Exchange	Wheat
February 1, 1985	Chicago Mercantile Exchange	Live Hogs
February 8, 1985	MidAmerica Commodity Exchange	Soybeans
February 27, 1985	Chicago Board of Trade	Corn
December 19, 1985	New York Cotton Exchange	Frozen Concentrated Orange Juice

INCREASE IN VOLUME OF FUTURES TRADING

Mr. WHITTEN. In the summary to your explanatory notes you talk about the ten-year growth of the industry from 27.7 million contracts in fiscal year 1974 to 149.4 million in 1984. What were some of the key factors that led to this growth?

RESPONSE. The phenomenal increase in the volume of futures trading that has occurred during the past decade primarily is due to the birth and explosive growth of entirely new segments within the futures industry. In fact, the three highest volume futures markets in 1985—U.S. Treasury Bonds, the S&P 500 Index, and Eurodollars—which accounted for 40 percent of total futures volume that year, did not even exist until after the CFTC came into existence in 1975. Although foreign currency futures and energy futures began trading in 1975, in recent years those markets also have grown substantially to become some of the most actively traded markets. Increased price volatility in the financial and energy sectors has given rise to the need for futures and options contracts to provide hedging and price discovery functions.

GROWTH OF FUTURES AND OPTIONS

Mr. WHITTEN. Where might you expect the number of contracts traded to be in the next decade? In other words, what type of continued growth might we expect through the year 1995?

RESPONSE. Although there is no reason to believe that existing contracts will not see continued growth, it appears that the next major growth area is in options. Commodity option trading on futures exchanges began in 1982, and it has grown rapidly. In 1985, for example, total option volume more than doubled from the prior year while futures volume increased by 6 percent. Moreover the absolute increase in the number of option contracts traded—10.1 million contracts—exceeds the total increase in futures volume in 1985. Additional growth can be expected when the Commission's option pilot program is expanded.

Looking a few years ahead, if the U.S. farm economy moves toward a system based more on international prices rather than on domestic support levels and as surplus supplies are consumed, I believe we will see a resurgence of agricultural futures trading and an associated expansion of agricultural options. There is also room for continued growth in energy and financial markets, not to mention new markets that have yet to be created. We expect this industry to continue its substantial growth into the next decade.

GROWTH TREND

Mr. WHITTEN. You also mention that the number of commodity professionals registered with CFTC has grown from 26,000 in fiscal year 1976 to about 70,000 in fiscal year 1985. You mention that the average amount of customer funds carried by a futures commission merchant has grown from $500,000 in 1971 to $8.7 million in 1980 to $27.6 million today. To what extent do you expect this trend to continue?

RESPONSE. At the present time, the commodity futures industry is in a period of consolidation, following a period of very rapid expansion in the late 1970s and early 1980s. As a result, the rate of growth in the number of registered commodity professionals actually declined slightly in the past year. Nonetheless, the Commission anticipates that the growth in the number of registrants will continue in the years ahead.

The Commission also expects that the average amount of customer funds carried by each futures commission merchant will increase. The introduction of futures on stock indices and other financial instruments has attracted a new type of customer to the futures markets, for example, banks, pension funds and insurance companies seeking to hedge the risks of carrying a portfolio of cash, securities and debt instruments. The use of the markets by these customers is still limited. However, the Commission has observed a growing interest in the markets by these types of entities and anticipates that, as they become more familiar with the markets, their use will increase, with the result that more customer funds will be held by futures commission merchants.

COMMODITY ACCOUNT PROTECTION

Mr. WHITTEN. To what extent are futures commission merchants required to be bonded or carry insurance on customer funds that they carry?

RESPONSE. At the present time, futures commission merchants are not required to be bonded or to carry insurance on customer funds. The Commission staff explored these and related issues, however, in a report on commodity account protection released last July in connection with its investigation of the failure of Volume Investors Corporation. That report reviewed the changes in the markets that had occurred since the Commission last formally looked at this issue in 1976 and the types of insurance programs that might be applicable. In the time available, however, the staff was unable to perform the analysis necessary to make a recommendation with respect to the necessity for an insurance program or the cost-effectiveness of the alternatives reviewed. Therefore, the staff recommended that the Commission request the National Futures Association to conduct an in-depth study of the issues contained in the staff report. The Commission has done so and will make NFA's findings available to the Committee upon conclusion of the study.

STAFF-YEAR REDUCTION

Mr. WHITTEN. You state that the Commission, after cuts resulting from the Balanced Budget and Emergency Deficit Control Act of 1985, will be able to fund only 493 staff-years. How many staff-years were you required to reduce as a result of Gramm-Rudman?

RESPONSE. Without the Gramm-Rudman-Hollings sequestration action the CFTC would have had adequate funds for 508 staff-years. The result was a personnel reduction of 15 staff-years. This 493 staff-year level in Fiscal Year 1986 is well below the Commission's Fiscal Year 1985 level of 533 staff-years.

BUDGET REDUCTIONS

Mr. WHITTEN. What other reductions did you apply to your available funds to comply with the 4.3 percent reduction?

RESPONSE. In addition to the 15 year-staff reduction, the Commission reduced planned ADP equipment purchases by $411,000 and ADP applications programming support services by $450,000. Additionally, other miscellaneous obligations for the Commission, including supplies, printing and transportation were collectively reduced by $31,000.

AUDIT TRAIL RULES

Mr. WHITTEN. Would you please provide for the record a copy of the audit trail rules that were published in the Federal Register on January 21, 1986?

[The information follows:]

FOR FURTHER INFORMATION CONTACT: Cheryl D. White, Export Administration, Department of Commerce, Washington, DC 20230, Telephone: (202) 377-2588.

SUPPLEMENTARY INFORMATION:

Rulemaking Requirements

In connection with various rulemaking requirements, Export Administration has determined that:

1. This rule is exempted from the provisions of the Administrative Procedure Act requiring notice of proposed rulemaking, an opportunity for public participation, and a delay in effective date (5 U.S.C. 553) pursuant to section 13(a) of the Export Administration Act of 1979, as amended. This regulation involves a foreign affairs and military function of the United States.

2. This rule removes a burden under the Paperwork Reduction Act of 1980, 44 U.S.C. 3501 *et seq.* by eliminating the requirement for a validated license to Country Groups Q, W, Y, PRC and Afghanistan. The reporting requirement for validated licenses has been approved by the Office of Management and Budget under control number 0625-0001.

3. Because a notice of proposed rulemaking is not required for this rule, it is not a rule within the meaning of section 601(2) of the Regulatory Flexibility Act and is not subject to the requirements of that Act. Accordingly, no preliminary of final Regulatory Flexibility Analysis has been or will be prepared.

4. Because this rule concerns a foreign affairs and military function of the United States, it is not a rule or regulation within the meaning of section 1(a) of Executive Order 12291 and, therefore is not subject to the requirements of that order. Accordingly, no preliminary of final Regulatory Impact Analysis has been or will be prepared.

Therefore, this regulation is issued in final form. Although there is no formal comment period, public comments on this regulation are welcome on a continuing basis.

List of Subjects in 15 CFR Part 399

Exports.

PART 399—[AMENDED]

Accordingly, the Export Administration Regulations (15 CFR Part 368-399) are amended as follows:

1. The authority citation for 15 CFR Part 399 continues to read as follows:

Authority: Pub. L. 96-72, 93 Stat. 503, 50 U.S.C. App. 2401 *et seq.*, as amended by Pub. L. 97-145 of December 29, 1981 and by Pub. L. 99-64 of July 12, 1985, E.O. 12525 of July 12, 1985 (50 FR 28757, July 16, 1985); Pub. L. 95-223, 50 U.S.C. 1701 *et seq.*; E.O. 12532 of September 9, 1985 (50 FR 36861, September 10, 1985).

2. In Interpretation 24, Chemicals, of Supplement No. 1 to § 399.2, under the heading of "Organic Chemicals", the words "Isononyl Alcohol" are inserted between "Isonisxid" and "Isooctyl Alcohol"; the words "Triisononyl Trimellitate" are inserted between "Triisohexylaluminum" and "Triisopropanolamine"; and the words "Triisooctyl Trimellitate" are inserted between "Triisononyl Trimellitate" and "Triisopropanolamine".

Dated: January 13, 1986.

Walter J. Olson,

Deputy Assistant Secretary for Export Administration, International Trade Administration.

[FR Doc. 86-1230 Filed 1-17-86; 8:45 am]

BILLING CODE 3510-DT-M

COMMODITY FUTURES TRADING COMMISSION

17 CFR Part 1

Trade Timing Standards and Exchange Audit Trail Systems

AGENCY: Commodity Futures Trading Commission.

ACTION: Final rule.

SUMMARY: The Commodity Futures Trading Commission ("Commission") has amended § 1.35 to require each contract market to meet an improved performance standard for the recording of trade times on the record required by § 1.35(e) ("trade register") and for effective trade reconstruction. The performance standard stated in the amended regulation requires that the time of execution of each futures and option trade be stated on the trade register in increments of no more than one minute in length. The rule has been amended to make clear that the actual time of execution need not be obtained by the trader himself but could be a time otherwise obtained that meets the Commission's performance standard and in some cases a single time for a transaction need only be obtained.

The amended regulation does not specify the method for meeting the performance standard, but instead permits a wide range of approaches and permits each contract market to comply with the standard in the manner it chooses. If a contract market meets the performance standard, it could use, for example, manual recordation, a technology-assisted system, exchange-recorded times, order "exit" times, or a combination of these or other approaches.

Amended § 1.35(g) also permits a contract market to submit rules to the Commission pursuant to section 5a(12) of the Commodity Exchange Act ("Act") and Commission regulation 1.41 defining and separately identifying opening and closing time periods. If such rules are approved, the contract market may use separate designations representing the opening and closing time periods to indicate execution times for trades executed during those periods.

The Commission also is amending § 1.35 by adding § 1.35(i)(1), which will become effective three months after the standard itself and which requires that a contract market, in order to demonstrate due diligence in maintaining its compliance program, demonstrate the ability to reconstruct trading rapidly and accurately using trade register data to identify and prove or disprove trading abuses. The amended regulation requires compliance with the performance standard on the effective date of that standard; thereafter, the contract markets will have the affirmative duty to demonstrate empirically compliance with the performance standard.

EFFECTIVE DATES: Amendments to § 1.35 (d), (e), and (g), and new regulation (i)(2) become effective October 1, 1986. New § 1.35(i)(1) becomes effective January 1, 1987.

FOR FURTHER INFORMATION CONTACT: Thomas M. McGivern, Attorney-Advisor, Division of Trading and Markets, Commodity Futures Trading Commission, 2033 K Street, NW., Washington, DC 20581. Telephone: (202) 254-8955.

SUPPLEMENTARY INFORMATION:

I. Introduction

Since its inception, the Commission consistently has maintained that accurate timing data are essential for effective trade reconstruction.[1]

[1] The Commission's efforts to achieve effective trade reconstruction through the use of improved timing data began with its formation in 1975. *See* 40 FR 50190, 50190-93 (December 27, 1984), and a September 28, 1984 memorandum by the Commission's Division of Trading and Markets regarding thirty-minute bracketing and exchange audit trail systems at pp. 3-10. After a series of advisory committee meetings on this issue in 1975 and 1976, the Comm ssion adopted former § 1.35(g), which, among other things, required each contract market to show on the record of each futures trade "the mechanically or electronically verified [recorded] time of execution of such futures trade to at least the nearest minute." 41 FR 56134 [December 23, 1976]. However, due to perceived inadequacies

Continued

These timing data are part of the totality of records essential to effective enforcement of the Act. Complete, accurate, and precise records, including trade timing data, discourage unlawful practices, prevent the concealment of illegal activity, and permit the disproof of such practices.

On December 27, 1984, the Commission published for comment in the Federal Register proposed amendments to its § 1.35(g). 49 FR 50190. These proposed amendments were developed in response to a recommendation in the Congressionally-mandated Commission study of insider trading that the contract markets improve their trade reconstruction capabilities by requiring more precise trade timing data,[5] and would have required the contract markets to adopt rules and implement improved trade reconstruction systems. Specifically, the proposed amendments would have required the verifiable mechanically or electronically recorded time of trade execution to the nearest minute by or for each party to every transaction. In addition to the mechanical or electronic recordation of these times on the § 1.35(d) record (trading card or order ticket), these times also would have been required to be recorded on the § 1.35(e) record (trade register). Under the proposed amendments, if rules for a verifiable mechanical or electronic system could not be submitted to the Commission within a specified time frame, contract markets instead, pursuant to a two-step process, could submit interim rules which required both parties to each transaction to record manually the trade execution time to the nearest minute, followed by implementation of an electronic or mechanical trade time recording system.

Although the comment period of the proposed amendment originally was due to expire on February 25, 1985, following a request from certain affected parties, the Commission determined to extend the comment period to April 26, 1985. See 50 FR 8639 (March 4, 1985). By June 3, 1985, the Commission had received 58 comment letters from industry participants, public users of the contract markets, and other interested parties. These comments included proposed audit trail alternatives submitted by the Chicago Board of Trade ("CBT"), the Chicago Mercantile Exchange ("CME"), and the New York Cotton Exchange ("NYCE"). The Commission staff prepared a "Summary of Comments" ("Summary"), dated June 13, 1985, which was distributed within the Commission and to two Commission advisory committees, and made available to the public upon request. The Summary did not discuss or evaluate the comments, but instead identified the issues addressed in the comments, and whether the commenter supported or opposed the proposed amendments.

In addition, the Commission staff requested and received additional detailed information from each of the contract markets regarding their particular trading environments and technical systems and, where applicable, their proposed audit trail alternatives; made numerous fact-finding visits to commodities, securities and option exchanges; and developed data and critical analyses related to improved contract market audit trails. The Commission in its promulgation of the amended regulation has relied, among other things, on the analyses and data presented by the staff.[6]

II. Issues Addressed in the Comments

Although the commenters generally agreed that contract market audit trails needed improvement, there was disagreement regarding current audit trail capabilities, the extent to which audit trails should be improved, and the methods for such improvement. For instance, a number of commenters who supported the proposed amendments stated that inadequacies in current trade reconstruction capabilities adversely affected their perceptions of the fairness of the markets.

As noted above, three exchanges submitted alternative audit trail proposals. In addition, several exchanges described their current or proposed computer-assisted trade surveillance systems, and the benefits of these systems for trade surveillance and reconstruction.

In general, the comments opposing the Commission's proposal focused on the proposed requirement that trade execution times be mechanically or electronically recorded. Opposing commenters claimed that currently there is no technology for such recording compatible with the auction process. The commenters also addressed the potential impact of audit trail improvements on market liquidity and efficiency.

The Commission considered carefully all of the comments, each audit trail alternative, and the additional information developed by the contract markets and Commission staff. In respose to the comments received, the amendments the Commission adopted significantly modify the Commission's original proposal.

A. "Mechanical or Electronic" Requirement Deleted

Many of the commenters which addressed the requirement that trade times be recorded mechanically or electronically stated that technology compatible with a multiple broker auction market trading environment presently is not available, would take years to develop, and would be prohibitively expensive. These commenters further stated that an adverse impact on market liquidity and efficiency would result if contract markets were required to adopt mechanical or electronic trade time recording systems.

After careful consideration of all comments concerning this issue, the Commission determined to delete from the amendments the requirement that verifiable mechanical or electronic means be used to record a time of execution. The Commission's purpose in proposing that such a reasonably independent means be employed to verify the accuracy of execution times can be achieved by other methods.[7]

In technological systems required to implement this regulation in a multiple broker auction market, the one-minute trade timing standard was not implemented by the Commission. Instead, after several delays, the present § 1.35(g) was adopted, which substituted a thirty-minute bracketing requirement for the one-minute timing standard. 48 FR 7975 (December 2, 1980).

[5] *See* "A Study of the Nature, Extent and Effects of Futures Trading by Persons Possessing Material, Nonpublic Information," Commodity Futures Trading Commission, September 1984, pp. 106-07.

[6] These staff analyses are set forth in six memoranda to the Commission, two previously confidential memoranda from the Division of Trading and Markets dated December 24 and November 16, 1984, three other memoranda from that Division dated August 23, September 23, and October 2, 1985, and a memorandum from the ADP Section dated August 14, 1985.

[7] For example, and without limiting other means, exchanges can determine the accuracy of the time submitted by a member by comparing it to the time submitted by the opposite party to the trade, the time the relevant trade price occurs on the time and sales reporter, and other times affixed to trade documents. Commission § 1.35(b) requires each contract market to maintain a record showing all price changes in futures and option transactions executed on the floor of the contract market. This record also must include the time of these price changes in increments of ten seconds or less. (All exchanges record price changes to the second except the CME, which records price changes in ten second intervals.) Each time any sales entry is referred to as a "print," and shows a trade price, and the time, in intervals of ten seconds or less, at which that trade price is entered into the exchange price reporting system. Most contract markets record price changes by stationing exchange employees ("pit reporters") in the trading pit, or in the pulpit on the edge of the pit, who observe prices at which trades are executed, and report or themselves keypunch the prices into an exchange data system which automatically records the time at which the prices are entered into the system.

Continued

Nonetheless, research indicates that technological components could be used to fulfill the performance standard.

The Commission also determined to accommodate concerns that the requirement of verifiable mechanical or electronic recordation could not be met in a timely manner without significant expense. The final amendments do not require a technology-assisted trade timing system, but permit each contract market to use technology to the extent it determines is appropriate to meet the one-minute performance standard. In addition, the deletion of this requirement eliminates the potential expense of the proposed two-step implementation process for those contract markets which initially could not comply with the technological requirement.

B. Proposed Alternative Audit Trail Systems

Some exchange commenters stated that current audit trail systems or proposed alternatives adequately addressed the Commission's goal of improving surveillance and trade reconstruction capabilities. After considering these comments, the Commission modified its proposal to widen the range of methods by which its performance standard could be met.

As noted above, the CBT, CME, and NYCE submitted alternative audit trail proposals as part of their comments on the proposed amendments. The CBT alternative would have required that "exit" times [8] from order tickets for all customer type indicator ("CTI") [9] 2, 3, and 4 trades be submitted to clearing, instead of the current thirty-minute bracket information. The Exchange stated that these exit times are close to the actual time of execution, and that its computerized compliance system could assign time and sales times to all trades, including CTI 1 trades (which would continue to be submitted to clearing with thirty-minute bracket data) for surveillance purposes.

The CME's audit trail proposal is similar to the CBT's proposal in its reliance on order "exit" times for CTI 2, 3, and 4 trades, but differs from the CBT's proposal in four respects. First, the Exchange would have required "regular" dual traders to record the minute of execution for all of their CTI 1 trades. In addition, "non-regular" dual traders would have been required to record the minute of execution for their CTI 1 trades from that point in time during the trading day when they first received for execution a CTI 2, 3, or 4 order until the end of that trading day, or longer, if the order was "live," but not yet executible. Otherwise, the execution time of trades by non-regular dual traders would have been stated as a thirty-minute bracket.

Second, the CME proposed to make the submission of a time denominated in minutes a clearing edit criterion (*i.e.*, trades would not be accepted for matching and clearing if not submitted with a time denominated in minutes) for CTI 2, 3, and 4 trades (a proposal CBT officials orally have stated also would be a requirement under their alternative[10]). Third, the CME would have required the submission of accurate account identification numbers with each trade. Finally, the CME would not have assigned presumptive time and sales times to trades for purposes of surveillance. However, CME officials orally stated that the Exchange would have the ability to use its computer system to compare the times submitted by members to time and sales register times for purposes of attempting to determine more precisely when a trade occurred (a practice this and other exchanges currently perform manually).

The NYCE, as part of its audit trail alternative, proposed that thirty-minute bracket periods currently used for trade timing be reduced to fifteen-minute periods. The Exchange also proposed that both entry and exist times be submitted to clearing for customer orders, that trading cards be numbered and sequenced, and that members be required to record trades on their trading cards in the exact order of execution. [11]

The Commission finds that all of these exchange proposals include a number of positive elements, and therefore has modified its proposal generally to accommodate these elements. First, the Commission has determined to permit the use of exit times to the extent that an exchange can demonstrate that the time recorded on the trade register is accurate to within one minute of the actual time of execution of the trade. Based on a Commission staff investigation, it appears, for example, that the standard could be met by exit times on orders that are hand-signalled ("flashed") from the trading pit to the order desk. The Commission staff's investigation of flashing indicates that it is used to relay order, execution, and price information on the CBT, CME, New York Futures Exchange ("NYFE"), and other exchanges. Current data from the contract markets, however, indicate that on the average, exit times for flashed and non-flashed orders considered together are not affixed until at least five minutes after trade execution. Thus, improvements in these exit times (those not within a minute of execution) or, exit times in combination with an alternate timing approach, would be necessary to satisfy the performance standard.

Second, the amendments being adopted, by permitting manual trade time recordation, will permit implementation of the CME's proposal insofar as it would require certain dual traders to record execution times manually. Nonetheless, the Commission has determined that, among other factors, due to the significant amount of CTI 1 trades, including CTI 1—CTI 1 trades, the contract markets must obtain the minute of execution for all market participants by an acceptable means.[12] Such times are necessary to deter, detect, prove and disprove the wide range of trading and market abuses identified by the Commission (*see* 49 FR

As an example of a trade time verification program, for trading in the Kansas City Board of Trade ("KCBT") Value Line Average Stock Index contracts, the Exchange's "Time Audit Listing," a compliance program generated for every trading day, compares the times (in minutes) submitted by members to the times submitted by opposite parties to the trade, and identifies those times that are not within two and a half minutes of each other. This program also compares the time submitted by the buy side of the trade to time and sales data, and identifies those trades that are not within two minutes of the time reported for the trade price on the time and sales register. Of course, the particular verification system used by each contract market will depend on the type of trade timing system implemented by the contract market.

[8] Commission § 1.35(a-1)(2) currently requires that a written record (order ticket) be prepared for each customer order received on an exchange floor, including the date and time, to the nearest minute, the order is received ("entry" time). Regulation 1.35(a-1)(4) requires an exit time, again to the nearest minute, to be stamped on the order ("exit" time) upon the report of an execution of that order from the exchange floor.

[9] "CTIs" or "customer type indicators," are required by Commission regulation 1.35(e) to be included in each exchange's trade register (and, therefore, to be recorded for all transactions). The four CTIs, which are recorded by members on clearing submission media, indicate whether the member was trading for:

(1) His own account (CTI 1);

(2) His clearing member's house account (CTI 2);

(3) Another member present on the exchange floor or an account controlled by such member (CTI 3), or

(4) Any other type of customer (CTI 4).

For CTI 3 trades not originating with a written, time-stamped order ticket, the minute of execution must be recorded by the executing broker pursuant to regulation 1.35(a-1)(3); however, this time is not required to be submitted to clearing—only the thirty-minute bracket in which the trade occurred is submitted.

[10] The Commission notes that the NYFE, where a relatively high number of transactions occur, stated in its comments its willingness to require all of its members, both brokers and traders, to record the minute of execution for their trades.

[illegible] selected categories of market participants (*i.e.*, "regular" dual traders) to meet the performance standard would result not only in disparate trade timing obligations, but also would lessen the potential for detection and proof of certain types of abuses (*e.g.*, wash trading).

Lastly, the Commission finds that other elements of the alternatives proposed by the contract markets also would improve audit trails.[9] The computer-assisted trade surveillance systems in use and being developed at a number of exchanges will aid in the effective surveillance of the improved data required under the Commission's performance standard. In addition, the CME proposal to require submission of account numbers to clearing will aid significantly in the identification of certain trading abuses.

C. Economic Aspects of Audit Trail Improvement

Commenters generally expressed mixed views on whether the direct and indirect benefits of improved audit trails outweighed direct and indirect costs. In this connection, two exchange commenters commissioned studies addressing certain costs and benefits of the Commission's proposal. Commission staff also investigated and analyzed both direct and indirect benefits, and direct and indirect costs, including the impact of audit trail improvements on liquidity. The Commission carefully considered these comments, studies, and staff investigations and analyses, and concludes that the overall benefits to trade reconstruction and the ability to demonstrate more fully the fairness of the markets outweigh overall associated costs. In addition, the Commission amended the regulation in a manner which should reduce direct costs substantially, as discussed below.

A number of commenters stated that the proposed requirement that the contract markets implement verifiable mechanical or electronic execution time recordation systems would be prohibitively expensive. The final regulation does not require such a system. Consequently, direct costs of implementing the final regulation are reduced and will depend upon the method selected by each contract market to meet the performance standard stated therein.

The commenters in general have not identified significant direct costs of manual trade time recordation systems. However, estimates of direct costs supplied by one contract market and similar information developed by Commission staff showed that an improved manual trade timing requirement could be implemented relatively inexpensively.[10] In addition, the Commission notes that for some exchanges these direct costs will be very limited, because the exchanges currently have readily-adaptable systems in place.[11]

With respect to the potential indirect costs of the proposed amendments, the commenters presented no persuasive data that improved contract market audit trails would materially, adversely affect liquidity, or materially increase transaction costs. Indirect costs discussed by the commenters, such as members' cost of learning "new" trade timing systems, can be expected to depend heavily on the type of system the contract market elects to use to meet the Commission's performance standard. For instance, the expected cost of "learning" a manual system of recording timing data should be low because the addition of trade timing data represents only a small increase in the amount of trade data that currently must be recorded manually to identify each trade.[12]

The direct benefits of an improved trade timing requirement include decreased surveillance and investigative costs because under the amendments being adopted this enhanced information will be required to be on the exchange's trade register. Consequently, routine surveillance and initial determinations regarding whether to review further suspect trades should be possible in most instances without the usually expensive and time-consuming reference to underlying trade documents.

As with indirect costs, indirect benefits are difficult to quantify, and both will not be determinable until after the exchanges implement improved audit trail systems. The Commission notes that some commodities market participants and other investors, including sophisticated financial managers, continue to harbor suspicions as to the fairness of the commodities markets. Thus, an indirect benefit of the contract markets' announcing and implementing materially improved trade timing systems may be an improved public perception of the fairness of these markets, thereby increasing public confidence and participation in the markets. Increased participation, in turn, should increase market liquidity and efficiency. Another indirect benefit that cannot be quantified, but which likely will result from improved surveillance

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[9] As an example, more precise trade timing data are needed for all CTI 1 trades. According to data supplied by the contract markets, CTI 1 trades are on one or both sides of 60 to over 95 percent of all transactions executed during the opening thirty-minutes of trading, when trading is generally heavy. Precise CTI 1 trade timing data are necessary for the detection and proof or disproof of trading abuses which may involve those trades alone, such as wash trading, intra-day speculative position limit violations, and both delivery and non-delivery month price manipulation. CTI 1 trades also may be involved with customer trades in indirect bucketing, where a broker washing to take the opposite side of a customer order that broker is holding will offer the order to an accommodating member, who records the trade as CTI 1. The accommodating member then offers the originating broker a trade identical to the customer order, resulting in a wash sale for the accommodating member and an indirect bucket for the broker.

In addition, without one-minute timing data for CTI 1 trades, the times for many trades executed during this time period, regardless of CTI, could not be verified adequately, because of the lack of a time denominated in minutes from both sides of the trade. This difficulty impacts not only the ability to reconstruct trading involving CTI 1 transactions, but also the ability to reconstruct trading involving other trades.

Finally, the CBT proposal, as currently constructed, to assign to trades for surveillance purposes times from the time and sales register in many instances would result in a presumptive time that would not be a reasonably reliable indication of the execution time, especially for CTI 1 trades.

[10] Exchange comment letters noted other positive aspects of current audit trail systems, such as the more frequent (within 30 minutes of the bracket period in which trades are executed) submission of trade data to clearing at the Commodity Exchange, and the practice at the Coffee, Sugar & Cocoa Exchange of attempting to capture *all* transaction prices, not just price changes, on the time and sales register.

[10] For example, direct costs of implementing a manual trade timing system might include: the reprogramming by clearing members of trade data submission systems to accommodate two or three additional characters representing the hour and minute of trade execution (currently one character representing the thirty-minute bracket is recorded); an incremental, continual cost to clearing members represented by the addition of two to three extra characters to clearing; the cost to clearing organizations of reprogramming clearing systems to accommodate a time denominated in minutes; and keypunching or otherwise placing that time on the exchange's trade register; and the related costs of reprogramming certain exchange compliance programs to integrate effectively the improved trade timing data (this last cost would be applied to any changed system).

Of course, there may be different direct costs for other trade timing systems which meet the Commission's performance standard.

[11] At the Amex Commodities Corporation, KCBT, Minneapolis Grain Exchange, and the Philadelphia Board of Trade one-minute trade timing systems currently are in use, although limited additional direct costs may need to be incurred in order for these systems to comply with the amendments being adopted. On the New York Mercantile Exchange, the "pit card" system of trade timing now in use also may be modified readily to comply with the Commission's performance standard.

[12] Currently, approximately ten characters are used to record essential trade data for each trade. This is the case even when traders may execute multiple transactions during a minute; one exchange estimated that as many as ten transactions per minute may be executed by some members on its markets.

incident to improved reconstruction capabilities, is the deterrence of trading abuses based on the greater likelihood of their detection.

III. Amendments to Regulation 1.35

A. Outline of Amendments

The amendments to § 1.35 the Commission is adopting to implement the improved trade timing performance standard consist of changes to existing §§ 1.35(d) and (g), and the addition of § 1.35(i).[13] Amended § 1.35(g) deletes the thirty-minute bracketing requirement of former § 1.35(g)(1) and adds a one-minute performance standard. New § 1.35(g) also requires that the minute of trade execution be obtained from both sides of each transaction, unless a contract market identifies a trade and records the time of the transaction, in which case that single time (in one-minute increments) may be used for purposes of satisfying the standard. These trade execution times, pursuant to amended § 1.35(g), must be shown on a contract market's trade register. Accordingly, amended § 1.35(g) includes two basic elements: (1) The one-minute trade timing performance standard, and (2) the requirement that trade execution times be shown on a contract market's trade register.

Regulation 1.35(g) also permits a contract market to submit rules to the Commission which define and separately identify opening and closing time periods of trading.[14] These time periods are characterized by active trading, but generally last little longer than one minute.[15] If rules submitted in this regard pursuant to section 5a(12) of the Act and § 1.41 are approved by the Commission, then single designations (one character for each period) representing the opening and closing of trading may be submitted to clearing in lieu of the minute of execution for trades executed during the opening and closing periods, even though those periods may be longer than one minute.[16] Additionally, all contract market rules in effect prior to the effective date of the amendments the Commission is adopting, and upon which a contract market intends to rely for compliance with § 1.35(g), would need to be resubmitted in accordance with section 5a(12) of the Act and regulation 1.41. In amending § 1.35(g), § 1.35(g)(2) also is altered, but not substantively, and becomes new § 1.35(i)(2).

New § 1.35(i) requires a contract market to perform certain tasks in order to demonstrate, at a minimum, that it is exercising due diligence in maintaining the continuing affirmative surveillance and enforcement program required by the Act and § 1.51. Specifically, new § 1.35(i)(1) requires that the contract markets demonstrate effective use in their compliance programs of the information required to be obtained pursuant to § 1.35(e) for the rapid and accurate reconstruction of trading conducted on or subject to the rules of their respective markets.

Finally, the second sentence of § 1.35(d) is amended by striking the phrase after the word "time"—"period (as described in paragraph (g) of this section)"—and adding in lieu thereof the words "(as specified in the rules of the contract market which comply with the requirements of this section)." This change was made to accommodate the potentially wide array of trade timing methods which may or may not require the executing member to record an execution time. For instance, in systems where the exchange records an execution time, or where exchange rules governing the submission of exit times are approved as meeting the requisite performance standard, the executing members may not be required to record a time.

B. The One-Minute Performance Standard

The improved performance standard of amended § 1.35(g) requires execution times for all trades. The Commission, after reviewing current trade reconstruction capabilities and considering the current trading environments and the alternatives proposed by commenters, determined that a one-minute performance standard is necessary to accomplish the purposes of the Act and regulations.[17] Commission staff found that in many instances current audit trail systems are not capable of providing the data necessary for precise, accurate reconstructions, and thus the proof or disproof of suspected trading abuses. Staff also found that in most cases, reconstructions using existing data are extremely labor-intensive and time-consuming. Further, Commission staff found that current audit trail data are insufficient for effective computer-assisted surveillance of all trading abuses, a practical necessity for more actively-traded contracts.

For example, the NYCE, as part of its comments on the Commission's proposed amendments, submitted a reconstruction of all trading (140 transactions) in one thirty-minute bracket period for its relatively lightly-traded cotton contract,[18] and another reconstruction of one broker's trading in cotton futures for an entire day (86 transactions). Although the NYCE reconstruction of the entire market for one thirty-minute bracket period appeared substantially accurate, the reconstruction of one broker's trading for an entire day revealed that approximately 19 percent of that broker's trades could not be assigned a definite execution time from the Exchange's time and sales register because of price repetition within the time frames into which the trades had been narrowed, all of which were greater than one minute.[19] This inability to reconstruct to within a minute for 19 percent of this broker's trades was not limited to a particular part of the trading day such as the opening or close, but rather occurred throughout the day.

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[13] In order to correct nonsubstantive typographical errors in § 1.35(e), this section also is being republished at this time. These errors include in the first sentence, striking "of" following the first mention of "floor broker," and inserting "or." In the second sentence, a comma is added following the word "trade."

Another nonsubstantive change is being made in § 1.35(d) to make that section gender neutral. Specifically, in the second sentence of § 1.35(g) the words "his own" are deleted, and the words, "the member's" are inserted. Similarly, in the last sentence of § 1.35(g) the word "him" is deleted and the words "the member" inserted in lieu thereof.

[14] Comments, including an exchange-commissioned economic study on the Commission's proposal, noted the particular characteristics of these periods and stated concerns about applying improved timing systems to trading during those periods.

[15] For instance, data supplied by the CBT for eight trading days in May 1985 show the opening time period for active-month Treasury Bond contracts, based on the time and sales register and the opening price range (as established by the Exchange). These data showed this period ranged from 37 seconds to one minute 22 seconds, with 88 percent of those opening periods of a duration of one minute or less. Similar data for the CBT soybean contract show an opening period range of 38 seconds to one minute 43 seconds, with an opening period duration of one minute or less in 72 percent of those instances.

[16] In this connection, opening and closing period symbols could be preprinted on trading documents for convenience.

[17] The Commission notes that the amended regulation states a minimum performance standard which permits the contract markets to adopt trade timing performance standards of less than a minute.

[18] In the first six months of 1985, 33 other contracts traded on the contract markets had a higher trading volume. The Commission also notes that the bracket period chosen for reconstruction, "B" bracket (11:00:00 to 11:29:59), generally is not the most active bracket period during the day.

[19] The principal method currently used for narrowing the time frame in which a trade involving an order ticket occurred is by use of entry and exit time-stamps. The difference between these two time-stamps can be less than thirty-minutes, thus narrowing the time frame in which the trade occurred. That time frame sometimes may be narrowed further by using the time and sales register, to determine at what time(s) during the narrowed time frame the trade price was recorded.

Thus, even in this lightly-traded market, the Exchange was not able to determine accurately when this broker's trades occurred, and therefore was unable effectively to reconstruct his trades. Significantly, the Exchange stated that these two, limited reconstructions required 480 staff hours, or the equivalent of one person working 58.25 days, to complete.

The Commission's Division of Enforcement ("Enforcement") has experienced similar difficulties in attempting to reconstruct trading when investigating suspected trading abuses. Enforcement staff sometimes spend hundreds of staff hours reconstructing trading in a single case, only to find that the timing, price, and other available data are not sufficiently precise to prove that the suspected trading abuses occurred, but also are so ambiguous that staff can not disprove such abuses.

A principal reason many current reconstructions are unable to prove or disprove suspected trading abuses is because of price repetition within the time frame in which suspect trades are narrowed. Because of the volume of transactions, speed, and volatility of commodities trading, prices often recur, even within relatively short time periods. Consequently, even though order tickets and other data (*e.g.*, order tickets from members on the other side of the trade, and the time and sales register) sometimes may narrow the period in which a trade occurred to five minutes or less, unless the trade price occurred uniquely within that time period, often it is not possible to reconstruct trading accurately and precisely. The usefulness of the data obtained is inversely related to the ambiguities created by price repetition. The Commission found that a significant reduction in price repetition and such ambiguities does not occur unless the actual time of execution is established in one minute increments.

Price repetition data compiled by Commission staff for a number of actively-traded contracts show dramatic differences in the percent of uniquely-occurring prices when comparing thirty-minute brackets to one-minute time periods. For example, data for an eleven trading-day period in CME live hog futures trading during January, 1985 show only 23.4 percent of prices occur uniquely in thirty-minute brackets; however, prices occur uniquely 90.9 percent of the time during one-minute time periods for trading in that contract. Thus, if, for instance, CME live hog trading were timed in one-minute increments, and this information also was accurate and recorded on the Exchange's trade register, CME compliance staff would have the ability to determine initially, without using the underlying trade documentation, when approximately 91 percent of all live hog futures transactions occurred.

Accordingly, the Commission has adopted a one-minute performance standard in amended § 1.35(g). This objective trade timing standard will provide data of sufficient precision for the contract markets and the Commission to fulfill their respective surveillance and enforcement duties under the Commodity Exchange Act, Commission regulations, and exchange rules. The Commission finds that an objective standard assures that all contract markets and their members are accorded equal treatment. An objective standard also is necessary to assess the performance of trade timing systems, *i.e.*, the accuracy of the trade times recorded. For instance, the mere submission of exit times for customer orders, without a performance standard, does not assure that such times are a reasonably reliable indication of the execution times, and thus a meaningful improvement in current overall audit trail capabilities.

The Commission notes that this one-minute standard applies to the accuracy of the times recorded on the trade register rather than when that information is recorded. Thus, the rule does not mandate that the time of the trade must be recorded during the minute after the trade's execution. Rather, the time of the trade which appears on the trade register must be the actual time of execution in one minute increments.

The Commission considered whether the performance standard should be less than a minute. As the figures discussed above from CME live hog futures trading indicate, there sometimes is price repetition even within one-minute time periods (in that case, 8.1 percent of the time). However, a trade timing standard of *less* than one-minute almost certainly would require mechanical or electronic trade time recording, which the Commission is not requiring at this time.

In conclusion, by requiring one-minute trade timing data to be placed on the trade register, the final amendments will enable contract markets initially to reconstruct most trading without going through the expensive and time-consuming process of requesting and reviewing the underlying trade documents. This will result in significant time and cost savings on a per inquiry basis for exchange and member firm compliance staffs and, therefore, should lead to increased coverage from the same amount of surveillance activity. In addition, these savings should be even greater on exchanges which integrate the one-minute trade timing data into computer-assisted surveillance systems.

C. Selecting Alternative Methods for Meeting the Performance Standards

As previously noted, based on the comments it received the Commission deleted from the amended regulation the requirements that trade times be recorded mechanically or electronically,[20] and that the regulation 1.35(d) record show execution times. These changes permit each contract market to select from a wide range of potential trade timing methods.

The trade timing method each contract market adopts will determine the extent of any rule submission the exchange will be required to make to the Commission under section 5a(12) of the Act and Commission § 1.41. For example, trade timing systems which impose obligations on members would require the submission of rules. In contrast, exchange-recorded systems may not require the submission of rules.[21] If an exchange determines to take advantage of the alternative timing method for the open and close of trading, the exchange also would be required to submit appropriate rules. Lastly, those exchanges which intend to reply on any current rules will be required to resubmit those rules.[22]

A contract market which determines to rely on exit times as an element of its trade timing system will be required to submit rules delineating member responsibilities under such a system and other exchange requirements. For example, exchange rules for implementing a system using flashed exit times for customer orders would need to address who would be responsible (*i.e.*, the broker or clearing member) for assuring that exit times are

[20] However, despite the deletion of a technological requirement, the Commission, based on an investigation of technology by its ADP Section and the general advances in technology since 1978 when the Commission first considered the issue, believes that such an approach may be viable for certain markets, and does not intend to discourage contract markets from pursuing technology-assisted systems which can meet the Commission's timetable for compliance with the performance standard.

[21] Each contract market's trade timing system, regardless of whether rules are required to be submitted, must assure the accuracy of the timing systems used.

[22] In addition, the implementation of a requirement that the submission of a time denominated in minutes be a clearing edit criterion also would require the submission of exchange rules, except in the case of exchange-recorded systems, where such a requirement could be met through a systems change.

affixed expeditiously to the order ticket following the flashed report out of the trading pit of execution information.[25]

The Commission, incident to its oversight responsibilities, will assess the efficacy of improve contract market trade timing systems. For that purpose, the Commission must be timely and fully apprised of the systems adopted by each contract market for complying with amended § 1.35. Therefore, the Commission hereby requests that each contract market report in writing no later than July 1, 1986, to the Secretariat of the Commission, stating how it intends to comply with amended § 1.35.[26] This request may be satisfied by including the requisite information in related rule submissions received by the Commission by the same date.

D. Integration of Improved Trade Timing Data in Contract Market Compliance Programs

Following the effective dates of the newly-adopted amendments, the Commission usually will conduct its oversight of adherence to the performance standard through the rule enforcement review process. However, the Commission also has retained authority under § 1.35(i)(2) to require from contract markets reports regarding the accuracy of all information, including trade timing information, required under § 1.35(e); and the use of this information in the contract market's surveillance and compliance program. The Commission intends to use this authority within a reasonable time after the implementation dates stated herein, and when necessary thereafter to assure a high level of accuracy of trade data and the effective use of these data.

In order for an exchange to integrate an improved trade timing system into its compliance program, it is essential that the system obtain execution times for each side of a trade (except in the case of exchange-recorded systems). Therefore, as proposed by the CME, the Commission believes that the best means of obtaining minimum compliance appears to be to require the submission of such times for clearing (*i.e.*, their submission would be a clearing edit criterion).

Regardless of the trade timing system employed, all exchanges will need to verify the accuracy of the times required for the trade register on an ongoing basis, and to sanction members appropriately who fail to submit accurate times as required. Where an exchange trade timing system is based on obtaining times for both parties to a trade, exchanges should compare times submitted by both parties to each trade to determine if these times are within predetermined parameters.[27] This verification process requires a time denominated in minutes for both sides of each trade. In addition, all trade times, regardless of the timing system, should be compared to the exchange time and sales register to determine if the relevant price occurred at a time within predetermined time parameters.[28]

If a contract market adopts rules regarding the timing of trades on the open and close, exchange compliance programs also would need to verify the trades executed during those periods. For instance, the submission of a symbol representing the open for one side of a trade would need to be compared to the opposite side of the trade to determine that the same symbol was submitted. In addition, prices at which opening and closing trades were executed would need to be compared to the opening and closing price range, to determine if the price was within the relevant range.

Because benefits of improved trade timing will be realized only through the effective use of these data in exchange compliance programs, the Commission is requiring in new § 1.35(i)(2) that the contract markets demonstrate the effective use of these data. Such a demonstration could be made by evidence that improved timing data had been integrated into existing exchange compliance programs, whether conducted manually or with the assistance of a computer. For manual surveillance, this may require only the revision of compliance manuals and surveillance methodologies. However, for more actively-traded contracts, or where a computer-assisted surveillance system is in use, effective integration may require reprogramming or new compliance procedures and reports.

E. Implementation Time of the Amended Regulation

Under the proposed amendments to § 1.35(g), the Commission proposed to require the contract markets to adopt and submit for Commission approval, within 90 days following the effective date of any final regulations, rules for either (a) a verifiable mechanical or electronic trade time recordation system, or (b) other, interim (manual) trade timing systems. A number of commenters stated that these implementation times were too short.

In setting the effective dates in the adopted amendments, the Commission carefully considered these comments, the importance of improving audit trail capabilities, and the nature of the changes required to satisfy the amendments. To allow contract markets ample time in which to implement the systems they select, and to submit rules to the Commission as necessary, the Commission is not requiring compliance with amended § 1.35(g) and new § 1.35(i)(2) until October 1, 1986. Further, the requirement that the contract markets demonstrate effective use of all § 1.35(e) data in their surveillance and compliance programs (new § 1.35(i)(1)), does not become effective until January 1, 1987. This additional period is intended to provide the contract markets with ample time in which to phase in compliance with the § 1.35(i)(1) requirement.

Of course, the Commission encourages earlier compliance with the adopted rules.[29] The Commission notes that a number of contract markets have stated that manual trade timing systems and automated integration of time and sales data with trade timing data could be implemented in three to six months. Contract markets should proceed expeditiously with implementation plans, including any rule submissions to the Commission.

IV. Related Matters

A. Section 15 of the Act

Section 15 requires the Commission to "take into consideration the public interest to be protected by the antitrust laws and endeavor to take the least

[25] These rules would be required to delineate the types of orders (*e.g.*, market, limit, stop, etc.) and also the CTI of orders for which exit times would be accepted. If, for instance, an exchange determined to permit CTI 2 orders to be timed ex-pit, the exchange also would be required to submit rules requiring that order tickets be prepared for all such orders. (The Commission presently does not have such a requirement, but would require the preparation of order tickets or an equivalent record as a precondition to permitting exit times to be used for CTI 2 trades.) In addition, exchange rules also would need to distinguish between flashed and non-flashed orders.

[26] Such reports should include, among other things, the trade timing methodology or system chosen by the exchange, the scheduled implementation dates, any empirical data necessary to show that the system will meet the performance standard (except that such a showing is not necessary for manual trade timing systems), methodologies or systems the exchange will use to ensure compliance with the standard, and a description of how the improved trade timing data will be integrated into the exchange's surveillance and compliance program.

[27] *See, e.g.*, footnote 4, *supra*.

[28] *Id.*

[29] Exchanges which implement trade timing systems which comply with the adopted amendments prior to the effective dates for the amendments could obtain "no-action" determinations from Commission staff regarding compliance with related provisions of current § 1.35

anticompetitive means of achieving the objectives of this [the Commodity Exchange] Act, as well as the policies and purposes of this Act, in . . . adopting any Commission rule or regulation. . . ."

The Commission considered, in light of Section 15, the amendments it is adopting and possible alternative courses of action for achieving the objectives of those amendments. The Commission finds that because it is adopting an objective performance standard equally applicable to all exchanges, and because of the wide array of methods for meeting that standard, there will be little, if any, anticompetitive effects on the contract markets or on market participants. In addition, the Commission finds that these effects, if any, are far outweighed by the paramount need, particularly in view of increasing contract market volume, for more precise surveillance and trade reconstruction data than currently are collected. These more precise data will permit the Commission and the contract markets to serve the public interest and achieve the regulatory objectives of the Act of assuring the fair and efficient functioning of the marketplace.

B. Regulatory Flexibility Act

The Commission is required to conduct initial and final regulatory flexibility analyses unless the Commission's Chairman certifies that a given rule will not, if promulgated, "have a significant economic impact on a substantial number of small entities." [48] The Commission previously has determined that the contract markets, to which these amendments expressly are directed, are not "small entities" for purposes of the Regulatory Flexibility Act ("RFA") (5 U.S.C. 605), and that the requirements of that Act do not, therefore, apply to contract markets. 47 FR 18618 (April 30, 1982).[49]

The Commission has adopted an objective trade timing performance standard which permits maximum flexibility in meeting this standard. The Commission notes that some potential trade timing systems or methodologies (such as manual recording systems) may be implemented with little or no direct costs. Therefore, since there may be little or no costs in implementing a trade timing system which achieves the performance standard, and only a few, if any, "small entities" would be involved, the rules adopted by the Commission will not have a significant economic impact on a substantial number of small entities.

For the reasons set forth above, and pursuant to Section 3(a) of the Regulatory Flexibility Act (5 U.S.C. 605(b)), the Chairman hereby certifies, on behalf of the Commission, that the following amendments to Commission § 1.35 will not have a significant economic impact on a substantial number of small entities.

C. Paperwork Reduction Act

The Paperwork Reduction Act ("PRA") of 1980, 44 U.S.C. 3501 *et seq.*, imposes certain requirements on federal agencies, including the Commission, in connection with their conducting or sponsoring any collection of information as defined by the PRA. Office of Management and Budget ("OMB") control number 3038–0022 previously has been assigned to Commission § 1.35. The Commission previously submitted the proposed amendments to the OMB, and further believes that the amendments it has adopted to § 1.35 will not materially change the amount of information the contract markets and individual market participants will be required to collect.

List of Subjects in 17 CFR Part 1

Brokers, Commodity futures, Price change register, Reporting and recordkeeping requirements, Trading cards, Time period, Time stamp.

In consideration of the foregoing, and pursuant to the authority contained in the Commodity Exchange Act and, in particular, sections 4, 4b, 4c, 4g, 4j, 5, 5a, 8, 8a, and 8c thereof, 7 U.S.C. 6, 6b, 6c, 6g, 6j, 7, 7a, 12, 12a, and 12c, the Commission hereby proposes to amend Chapter I of Title 17 of the Code of Federal Regulations as follows:

PART 1—GENERAL REGULATIONS UNDER THE COMMODITY EXCHANGE ACT

1. The authority citation for Part 1 is revised to read as set forth below and the authority citations following all the sections in Part 1 are removed:

Authority: 7 U.S.C. 5, 4, 4a, 6, 6a, 6b, 6c, 6d, 6e, 6f, 6g, 6h, 6i, 6j, 6k, 6l, 6m, 6n, 6o, 7, 7a, 9, 12, 12a, 12c, 13a, 13a–1, 13a–2, 16, 19, 21, 23, and 24; 5 U.S.C. 552 and 552b, unless otherwise noted.

2. Section 1.35 is amended by revising paragraphs (d), (e) and (g), and by adding new paragraph (i) to read as follows:

§ 1.35 Records of cash commodity, futures, and option transactions.

* * * * *

(d) *Members of contract markets.* Each member of a contract market who, in the place provided by the contract market for the meeting of persons similarly engaged, executes purchases or sales of any commodity for future delivery or commodity option on or subject to the rules of such contract market, shall prepare regularly and promptly a trading card or other record showing such purchases and sales. Such trading card or record shall show the member's name, the name of the clearing member, transaction date, time (as specified in rules of the contract market which comply with the requirements of this section), quantity, and, as applicable, underlying commodity, contract for future delivery or physical, price or premium, delivery month or expiration date, whether the transaction involved a put or a call, and strike price. Such trading card or other record shall also clearly identify the opposite floor broker or floor trader with whom the transaction was executed, and the opposite clearing member (if, in accordance with the rules or practice of the contract market, such opposite clearing member is made known to the member).

(e) *Contract markets.* Each contract market shall maintain or cause to be maintained by its clearing organization a single record which shall show for each futures or option trade: the transaction date, time (as described in paragraph (g) of this section), quantity, and, as applicable, underlying commodity, contract for future delivery or physical, price or premium, delivery month or expiration date, whether the transaction involved a put or a call, strike price, floor broker or floor trader buying, clearing member buying, floor broker or floor trader selling, clearing member selling, and symbols indicating the buying and selling customer or option customer types. The customer and option customer type indicators shall show, with respect to each person executing the trade, whether such person

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[48] 5 U.S.C. 605(b)

[49] Entities that may be indirectly affected by this proposal are futures commission merchants ("FCMs") and floor brokers. As to FCMs, the Commission has stated that they are not small entities for purposes of the RFA. 47 FR 18620 n. 10. As to floor brokers, the Commission has observed that "[b]y and large, floor brokers act as individuals" and that the RFA does not apply to individuals. *Id.* In that regard, the Commission has noted that only a small number of floor brokers are business entities. Thus, there is no substantial number of small entities which could be affected by this proposal. In any event, because the Commission's performance standard permits each exchange to select the method for meeting that standard, and because there are methods available that could meet the standard with little costs, there will be no significant economic impact on small entities.

(1) Was trading for his own account;

(2) Was trading for his clearing member's house account;

(3) Was trading for another member present on the exchange floor, or an account controlled by such other member; or

(4) Was trading for any other type of customer or option customer. The record required by this paragraph (e) shall also show, by appropriate and uniform symbols, any transaction which is made non-competitively in accordance with written rules of the contract market which have been submitted to and approved by the Commission in accordance with the provisions of § 1.38, and trades cleared on dates other than the date of execution. Except as otherwise approved by the Commission for good cause shown, the record required by this paragraph (e) shall be maintained in a format and coding structure approved by the Commission (i) in hard copy or on microfilm as specified in § 1.31 and (ii) for 60 days in computer-readable form on compatible magnetic tapes or discs.

* * * * *

(g) *Time of trade execution.* For purposes of paragraph (e) of this section: (1) The actual time of the execution of each side of a transaction must be obtained, or (2) if a contract market identifies and records the time of a transaction, a single actual time of execution for both sides of the transaction may be obtained. Actual times of execution shall be stated in increments of no more than one minute in length. If a contract market submits rules to the Commission, in accordance with the provisions of section 5a(12) of the Act and § 1.41, defining and separately identifying opening and closing time periods, the contract market may, for purposes of paragraph (e) of this section, use those time periods for trades occurring during the opening and closing periods. Contract market rules in effect prior to the effective date of this paragraph (g) upon which a contract market intends to rely in complying herewith must be submitted for this purpose to the Commission in accordance with the provisions of section 5a(12) of the Act and § 1.41.

* * * * *

(i) *Contract markets.* A contract market, in order to demonstrate that it is exercising due diligence in maintaining the continuing affirmative action program required by the Act and § 1.51, shall, at a minimum:

(1) Demonstrate effective use in its continuing affirmative action program of the information required to be obtained by paragraph (e) of this section to reconstruct rapidly and accurately transactions executed on or subject to the rules of such contract market; and

(2) Submit to the Commission such reports as the Commission or the Director of the Division of Trading and Markets, or such persons under the supervision of the Director as may be specified from time to time, may require concerning the accuracy of all information recorded under paragraph (e) of this section and the use of such information in the contract market's affirmative action program.

Issued in Washington, DC on January 15, 1986 by the Commission.

Jean A. Webb,

Secretary to the Commission.

[FR Doc. 86-1231 Filed 1-17-86; 8:45 am]

BILLING CODE 6351-01-M

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Food and Drug Administration

21 CFR Part 172

[Docket No. 85F-0138]

Food Additives Permitted for Direct Addition to Food for Human Consumption; Polyhydric Alcohol Diesters of Oxidatively Refined Montan Wax Acids

AGENCY: Food and Drug Administration.

ACTION: Final rule.

SUMMARY: The Food and Drug Administration (FDA) is amending the food additive regulations to provide for the safe use of polyhydric alcohol diesters of oxidatively refined (Gersthofen process) montan wax acids as a component of coatings on fresh citrus fruit. This action responds to a petition filed by American Hoechst Corp.

DATES: Effective January 21, 1986; objections by February 20, 1986. The Director of the Office of the Federal Register approves the incorporation by reference of certain publications in 21 CFR 172.210 effective on January 21, 1986.

ADDRESS: Written objections to the Dockets Management Branch (HFA-305), Food and Drug Administration, Room 4-62, 5600 Fishers Lane, Rockville, MD 20857.

FOR FURTHER INFORMATION CONTACT: Vir Anand, Center for Food Safety and Applied Nutrition (HFF-335), Food and Drug Administration, 200 C Street SW., Washington, DC 20204, 202-472-5690.

SUPPLEMENTARY INFORMATION: In a notice published in the Federal Register of May 13, 1971 (36 FR 8820), FDA announced that a petition (FAP 1A2372) had been filed by American Hoechst Corp., Somerville, NJ 08876, proposing that § 172.210 *Coatings on fresh citrus fruit* (21 CFR 172.210) be amended to provided for the safe use of formulations comprised of polyhydric alcohol diesters of oxidatively refined (Gersthofen process) montan wax acids and the adjuvants petroleum naphtha, morpholine, and salts of fatty acids as coatings on fresh citrus fruit. The petition was subsequently amended to exclude the use of morpholine and petroleum naphtha.

FDA has evaluated data in the petition and other relevant material and concludes that the proposed use of the polyhydric alcohol diesters of montan wax acids is safe, and that the regulations should be amended as set forth below.

The regulations currently provide in § 172.863 (21 CFR 172.863) for the use of salts of fatty acids in food, including coatings. Section 172.863 covers the use of salts of fatty acids requested by this petition. Therefore, FDA is not taking any action in response to this aspect of the petition.

In accordance with § 171.1(h) (21 CFR 171.1(h)), the petition and the documents that FDA considered and relied upon in reaching its decision to approve the petition are available for inspection at the Center for Food Safety and Applied Nutrition (address above) by appointment with the information contact person listed above. As provided in 21 CFR 171.1(h), the agency will delete from the documents any materials that are not available for public disclosure before making the documents available for inspection.

The agency has carefully considered the potential environmental effects of this action and has concluded that the action will not have a significant impact on the human environment and that an environmental impact statetment is not required. The agency's finding of no significant impact and the evidence supporting that finding may be seen in the Dockets Management Branch (address above) between 9 a.m. and 4 p.m., Monday through Friday. FDA's regulations implementing the National Environmental Policy Act (21 CFR Part 25) have been replaced by a rule published in the Federal Register of April 26, 1985 (50 FR 16636, effective July

BUDGET REDUCTION

Mr. WHITTEN. Would you please provide for the record a comparison of your 1987 budget request to Congress, with the 1987 budget request to OMB, on an object class basis? Would you also describe any specific reductions that were made by OMB to your budget?

RESPONSE. I will submit for the record a table which reflects the object class comparison in the Commission's 1987 budget submission to OMB and the Congress. The reductions reduced desired staffing by 59 staff-years which would have been primarily allocated to the Commission's enforcement, market surveillance/analysis and contract market functions. Other major changes include significant reductions from desired levels of ADP service and equipment.

[The information follows:]

O/C	Item	OMB	Congress
11	Personnel Compensation:		
	Full-time Permanent	$19,436	$17,869
	Other Than Permanent	281	281
	Other Personnel Compensation	420	420
	Special Personnel Services Payments	10	8
	Subtotal Personnel Compensation	20,147	18,578
12	Personnel Benefits: Civilian	2,509	2,242
13	Benefits for Former Personnel		
21	Travel and Transportation of Persons	900	644
22	Transportation of Things	33	15
23	Communications, Utilities and Other Rent	6,965	6,061
24	Printing and Reproduction	314	303
25	Other Services	2,200	1,675
26	Supplies and Materials	477	395
31	Equipment	676	405
	Total, Direct Obligations	34,221	30,418

STAFFING BY PROGRAM

Mr. WHITTEN. In terms of total staffing, what positions were disallowed by OMB, or what would be the impact of OMB's funding level on your total positions, and what impact will that have on the agency's programs?

RESPONSE. In September 1985 the Commission submitted a FY 1987 budget request to OMB which would have supported 567 staff-years, an increase of 74 staff-years over the FY 1986 funded level of 493. Forty of the staff-years requested would have restored the Commission to its authorized 533 level, and the additional 34 staff-years would have allowed expansion of Commission programs. In addition, the Commission requested $206,000 for expanded contractor programming support to implement the FY 1987 goals in the five-year ADP Plan.

The OMB mark which the Commission received in December 1985 disallowed the requested increase in contractor programming support but recommended funding for 15 additional staff-years out of the 74 requested. This will put total Commission staff at 508, still 25 staff-years below the FY 1985 authorized level of 533. I will submit a comparison of the agency's original request to OMB and current request to Congress.

The OMB recommended level will affect every program in the Commission. The agency will perform fewer oversight audit and rule enforcement reviews and do fewer reviews of potential market problems. In some areas, such as the General Counsel's Office where the work in the litigation area is primarily reactive, the staff will have to take longer to accomplish its work and will have to work longer hours. However, the Commission will be able to maintain all of its essential functions at the 508 staff-year level.

[The information follows:]

STAFF-YEARS BY PROGRAM

	Authorized FY 1985 level	FY 1986 level	Request to OMB	Request to Congress
Agency Direction	38	37	37	37
Enforcement	130	123	160	131
Market Surveillance	105	97	109	99
Registration, Audits and Contract Markets	104	95	104	97
Administrative Support Services	88	80	89	82
Proceedings	34	29	31	29
Legal Counsel	34	32	37	33
Total	533	493	567	508

FEE COLLECTION

Mr. WHITTEN. During fiscal year 1987, you state that the Commission expects to collect about $1 million in service fees. How are these fees collected?

RESPONSE. The fees are collected in a variety of ways. Fees for rule enforcement reviews, leverage audits and subscriptions to Commission publications are collected on an annual basis. Fees for contract market designation, leverage commodity registration and filing reparation complaints must be submitted at the same time as the filing is made. Fees for Freedom of Information Act requests, for photocopying or for miscellaneous publications are collected either at the time of request or by invoice. All fees collected by the Commission are deposited directly in the general funds of the U.S. Treasury and are not kept by CFTC.

ANTICIPATED FEES IN FY 1987

Mr. WHITTEN. How will your collections in 1987 compare with your collections in fiscal year 1986?

RESPONSE. I expect collections to be about the same in both fiscal years. While some fees will be increased, the Commission expects to decrease its collection of fees for floor broker registrations should there be a transfer of registration processing to the industry.

DISPOSITION OF RECEIPTS

Mr. WHITTEN. What controls do you have on these fees that you collect as far as to how you can use them?

RESPONSE. As noted, the Commission cannot use the fees that it collects. All receipts are deposited into the general fund maintained by the Treasury Department.

AGRICULTURAL ADVISORY COMMITTEE MEMBERSHIP

Mr. WHITTEN. Who are the members of the Agricultural Advisory Committee?

RESPONSE. I will submit a membership list for the record.

[The information follows:]

Kalo A. Hineman, Commissioner, Commodity Futures Trading Commission, Chairman, Agricultural Advisory Committee.

Stanley Forbes, Sovran Bank, Charlottesville, Virginia, American Bankers Association.

Dean Kleckner, Park Ridge, Illinois, American Farm Bureau Federation.

Roy Smith, Plattsmouth, Nebraska, American Soybean Association.

David Schoeder, Farm Credit Services, St. Paul, Minnesota, Farm Credit Council.

Weldon V. Barton, Washington, D.C., Independent Bankers Association.

Darl Kleinbach, Arlington, Oregon, National Association of Wheat Growers.

Sewell L. Spedden, Perdue Farms, Salisbury, Maryland, National Broiler Council.

H. Richard Farr, Greeley, Colorado, National Cattlemen's Association.

Harold Cutler, Scotland Neck, North Carolina, National Corn Growers Association.

James H. Sanford, Prattville, Alabama, National Cotton Council of America.

Harold Richard, AGRI Industries, West Des Moines, Iowa, National Council of Farmer Cooperatives.

Paul Nauer, Jennings, Kansas, National Farmers Organization.

Marv Hanson, Hallock, Minnesota, National Farmers Union.

Dewayne Bloem, Land O'Lakes, Minneapolis, Minnesota, National Grain and Feed Association.

Peter A. Kooi, Cargill, Inc., Minneapolis, Minnesota, National Grain Trade Council.

Lester Wallace, Beloit, Wisconsin, The National Grange.

Wayne Walter, Sublette, Kansas, National Pork Producers Council.

E. Robert Kern, ConAgra, Inc., Omaha, Nebraska, Milliers National Federation.

Harold S. Hukins, Bunge Corporation, New York, New York, North American Export Grain Association.

John Goss, Allenberg Cotton Company, Memphis, Tennessee, American Cotton Shippers.

Tommy B. Willis, Brownsville, Tennessee, American Agriculture Movement, Inc.

Mr. WHITTEN. Who are the members of the Financial Products Advisory Committee?

RESPONSE. I will submit a list of the members of the Financial Products Advisory Committee.

[The information follows:]

Robert R. Davis, Commissioner, Commodity Futures Trading Commission, Chairman, Financial Products Advisory Committee.

Barbara Dixon, Shearson Lehman Brothers, Inc., New York, New York.

David M. Dunford, Travelers Insurance Company, Hartford, Connecticut.

William A. Dunn, Dunn Commodities, Inc., Stuart, Florida.

David W. Gibson, Wolcott & Lincoln, Inc., Kansas City, Missouri.

Robert W. Goetter, Harris Trust and Savings Bank, Chicago, Illinois.

John Manley, Touche Ross & Co., New York, New York.

John R. Kinsella, Jernigan-Kinsella & Co., Chicago, Illinois.

Louis I. Margolis, Salomon Brothers, Inc., New York, New York.

Edward F. McCartin, Hammer Trading Company, Chicago, Illinois.

David I. Meiselman, Virginia Polytechnic University and State University, Falls Church, Virginia.

Gary L. Perlin, Federal National Mortgage Association, Washington, D.C.

Richard L. Sandor, Drexel Burnham Lambert Incorporated, Chicago, Illinois.

Keith M. Schappert, J.P. Morgan Investment Management, Inc., New York, New York.

Gary L. Seevers, Goldman, Sachs & Co., New York, New York.

George E. Crapple, Millburn Partners, New York, New York.

COOPERATIVE EXTENSION SERVICE

Mr. WHITTEN. You have worked with the USDA Extension Service to help them develop educational literature and programs regarding agricultural options. Would you please describe what your efforts have been in this area, as well as provide some of the material that has been jointly developed?

RESPONSE. The Commission has assisted the USDA Cooperative Extension Service in developing a futures training program for state extension specialists geared toward producers. The Commission's economics and education staff participated as members of a USDA Cooperative Extension project team which decided on the training method to use and developed the training workbooks and materials to be used in the program. While the program's major emphasis is on futures and options, it includes all marketing alternatives for farmers. This educational program is available to the producer in all farm states through the Cooperative Extension Service.

[CLERK'S NOTE: The information requested is too voluminous to be reprinted in the record. Copies will be retained on file.]

AGRICULTURAL OPTIONS

Mr. WHITTEN. On October 29, 1984, the Commission approved the trading of options on six agricultural futures contracts: live cattle, soybeans, wheat, and cotton. The wheat contracts would be traded on three contract markets. You have also designated corn, live hogs, and soybeans as of January 1985. How might a farmer make use of these options on an agricultural futures contract? Please give us some specific examples.

RESPONSE. Agricultural options provide an additional way for farmers to reduce the risk of adverse price movements for the commodities they produce. Purchased put options can set a floor to the price the farmers can expect but do not set a maximum price. Futures can be used to set a price but do not generally allow the farmer

to benefit from price rises in the underlying cash commodity. The cost of the extra benefit the put option provides is the premium or price of the option.

The following example provides a comparison of how a soybean farmer might hedge his crop by a short futures position or by purchasing put options. Suppose for simplicity that the cash price the farmer faces is the Chicago price. Assume the May 15 futures price of soybeans for November delivery was $6.07 per bushel and the price—premium—of an option on the November futures contract, with an exercise price of $6.00 per bushel, was $0.24 per bushel. If the farmer sold a futures contract on May 15 and lifted the hedge and sold the cash commodity five months later when the futures price ws $5.14, he would have lost $0.93 on his cash crop and would have made approximately $0.93 per bushel profit on his futures and cash position, offsetting the loss in the cash market. If the farmer had purchased a put option it would be worth approximately $0.86 per bushel—$6.00 strike price minus $5.14 commodity price. The increased value of the option would tend to offset the loss in the cash market. Thus, the net loss would be $.31 per bushel—$.93 loss on the cash commodity plus $.24 cost of the option minus $.86 value of the option.

If the price of soybeans instead had risen to $7.00 per bushel at the expiration of the option, the farmer who was hedged in futures would have lost approximately $0.93 per bushel on his futures position offsetting the gain in the cash market. However, a farmer who purchased put options would abandon the worthless put and lose the premium of $0.24 per bushel, while gaining $.93 per bushel on the cash commodity for a net gain $.69 per bushel.

A similar type of hedging activity could be employed by livestock feeders to protect against potential increases in feed grain prices by purchasing call options, thereby protecting against prices rises above the option's stike price, while retaining the ability to profit from a fall in grain prices below the option's strike price.

CONGRESSIONAL LIAISON

Mr. WHITTEN. How many people does the Commission have assigned to the function of congressional liaison, and what is the annual budget of that function?

RESPONSE. The Commission has two people assigned to the intergovernmental affairs function. The Commission's congressional affairs activity is one element of the intergovernmental affairs function. This function is required under Section 2(a)(8) of the Commodity Exchange Act so that appropriate and necessary liaison is maintained with the U.S. Department of Agriculture, the U.S. Department of the Treasury, the Federal Reserve Board, the Securities and Exchange Commission, and other governmental agencies both domestic and foreign who may have mutual interests. The budget for the full salary and benefits of these two people is $83,000.

FIRM FAILURES

Mr. WHITTEN. What failures occurred during the past year of firms trading in options or futures, and what impact did that have on the individuals who traded with those firms?

RESPONSE. Although several firms went out of business in 1985, with only one firm, Volume Investors Corporation, did customers face potential losses. In this case, the potential loss to non-defaulting customers was approximately $3.6 million. However, a court-appointed receiver was able to make a partial payment of approximately $.50 on the dollar to such customers last fall and, earlier this year, was able to pay the balance due from loans from Commodity Exchange, Inc. and one of the principals of Volume.

In the past two years, four other firms failed, as a consequence of the failure of affiliated firms that dealt primarily in government securities repurchase programs. In each instance, however, all commodity futures and options customer accounts and customer funds were transferred to other futures commission merchants under Commission oversight without loss. These transfers involved in excess of $270,000,000 in customer funds.

RELATIONSHIP WITH NFA

Mr. WHITTEN. For the record, please give us a detailed explanation of the relationship between the National Futures Association and the Commodity Futures Trading Commission.

RESPONSE. As a futures association organization registered by the Commission, the National Futures Association is subject to the oversight and scrutiny of the Commission. The Commission's authority with respect to NFA is essentially no different from its authority over the several futures exchanges, which are also self-regulatory

organizations under the Commodity Exchange Act. To date, a spirit of cooperation has marked the relationship between the Commission and NFA, as NFA has developed and implemented its self-regulatory program. The Commission has every reason to expect that such cooperation will continue.

As you will recall, the Commission submitted a report to Congress in December 1985 on the regulatory experience of NFA. Based on its continuing review and oversight of NFA during the past four years, the Commission found that NFA generally has succeeded in meeting its mandate under the Act to adopt and implement a comprehensive self-regulatory program in the public interest.

FUTURES TRADING INFORMATION

Mr. WHITTEN. What efforts do you make in the way of educating university students or farmers in agricultural commodity trading?

RESPONSE. Over the last five years, the Commission has witnessed a dramatic increase in the number of agricultural marketing courses being offered in colleges and universities in the U.S. In late 1984 the Commission completed a survey of almost 200 colleges and universities in the U.S., including all land grant universities. Of those responding, 40 percent indicated they offered courses about commodity markets. Because of the increasing commitment of higher educational institutions to teaching courses on the role futures markets play in hedging price risk in agricultural markets, the Commission has not attempted to supplement the basic futures education of university students. The Commission, however, responds to requests for information from all students ranging from grammar school students to college professors.

As part of its effort to supplement futures trading information available to the academic community, the Commission in the past year has provided more than a dozen university libraries throughout the country with futures trading data—Commitments of Traders Reports—for the past 15 years. As of January 1986, current futures trading data is available to the academic community through the 386 federal depository libraries around the country.

Senior professional employees at the Commission also regularly contribute to increasing knowledge at the university level through their participation in industry and professional meetings, many of which are sponsored by university professors. In addition, the Commission encourages the submission of papers to professional journals and meetings, and quite often these papers are at the forefront of knowlege in the field. In this way, new concepts and relevant issues are brought to the attention of the academic community. During the past year, senior Commission employees presented written papers, or participated as panel members at the American Agricultural Economics Association, the American Bar Association, state bar associations, Public Law Institute News, University of Maryland, Chicago-Kent College of Law, Brookings Institution, and Kansas State University.

The Commission has also worked with the Cooperative Extension Service to develop educational training materials and workbooks for extension specialists at the state level to use in training farmers to use futures and options markets. Copies of these workbooks are submitted in response to an earlier question by Mr. Whitten. The Commission has also worked, through the members of its Agricultural Advisory Committee, to inform farmers and others in the agricultural community about changes and issues in futures and options market regulation. Further, the Office of Communications and Education Services also publishes a quarterly newsletter, the AgReport, which is designed to inform organizations and individuals in the agricultural sector about current regulatory changes and issues in futures and options markets, as well as periodic information about other sources for available information on futures and options markets. The newsletter is distributed to approximately 800 leaders in various agricultural institutions and organizations.

ADVISORY COMMITTEE

Mr. WHITTEN. How many advisory committees does the Commission currently have, and what is the budget of each of those committees?

RESPONSE. At the present time, the Commission has three advisory committees: the Financial Products Advisory Committee, chaired by Commissioner Robert R. Davis; the Agricultural Advisory Committee, chaired by Commissioner Kalo A. Hineman; and the Advisory Committee on CFTC-State Cooperation—formerly the Advisory Committee on State Jurisdiction & Responsibilities under the Commodity Exchange Act—Commissioner Fowler C. West is scheduled to be appointed chairman of this advisory committee.

There is no separate budget for any of the three advisory committees. Financial and agricultural advisory committee members attend committee meetings at their own expense. The few minor costs incurred in conducting official advisory committee business, such as transcript costs and travel costs incurred by Commission staff, are charged against the budgets of the appropriate offices within the Commission. In the case of the Advisory Committee on CFTC-State Cooperation only, per diem allowances and travel costs for non-Commission advisory committee members are charged against the general operating budget of the Commission.

CONSULTANTS

Mr. WHITTEN. What consultants were employed by the Commission during calendar year 1985, and what was the purpose of each of those consultants?

RESPONSE. The Commission did not employ consultants during calendar year 1985.

IMPACT OF GRAMM-RUDMAN

Mr. WHITTEN. Please describe for the record what the impact on the programs of the Commission would be if Congress were to approve your budget as requested, but under Gramm-Rudman you were required to take a 10 percent across-the-board reduction? You might discuss this in terms of the programs of each of the major functions of the Commission.

RESPONSE. Because almost all of the Commission's budget is used for personnel or fixed costs, the effect would be devastating. Although we have not examined how a 10% reduction would affect each program, it would probably require a reduction of 30 to 40 staff-years from the proposed 508 level, elimination of all discretionary spending such as awards and training, reduction of library materials and support equipment, and require a halt in our five-year ADP development plan. With such a substantial reduction, the Commission would have to examine its programs closely and possibly eliminate certain functions. In addition, the Commission is assuming that it will not have to undertake additional responsibilities as a result of its current reauthorization process.

LEGAL COUNSEL STAFF

Mr. WHITTEN. For fiscal year 1987 you are requesting 33 staff years for the Office of Legal Counsel. How many of these are attorneys and how many are clerical or other positions?

RESPONSE. The 33 staff-years include 25 attorneys, one paralegal, and seven legal technicians and secretaries.

INCREASE IN LEGAL WORKLOAD

Mr. WHITTEN. Over the last several years the Commission has experienced a very significant increase in its legal workload, yet the legal staff has remained approximately the same size. How have you been able to accomplish this increase?

RESPONSE. The Office of Legal Counsel has attempted to adjust to its increased workload by streamlining its operations without sacrificing quality. For example, the Office has kept to a minimum the amount of internal review of staff work, has provided more internal staff training, and has implemented more efficient assignment tracking procedures. In the litigation area, the Office has increased its filing of potentially dispositive motions at early stages of cases and has hired a number of attorneys with several years of litigation experience. Despite these efforts, the Office of Legal Counsel has experienced significant strains in satisfying the Commission's growing legal needs, and its attorneys have often expended a substantial amount of uncompensated weekend and evening time to meet those needs.

FOIA WORKLOAD

Mr. WHITTEN. You state that one area of your legal work showing a particularly large increase was administrative litigation involving Freedom of Information Act and confidential treatment request appeals to the Commission. Please describe what the workload involves in this area.

RESPONSE. The Office of Legal Counsel reviews all appeals to the Commission from staff determinations issued in response to Freedom of Information Act and confidential treatment requests. The Office prepares a written recommendation to the Commission whether the initial determination should be affirmed, modified, or reversed. Often, this process involves the detailed review of hundreds or thousands of pages of documents responsive to Freedom of Information Act requests. In addi-

tion, the reviewing attorneys must keep abreast of recent judicial decisions interpreting the Freedom of Information Act. The Office strives to provide Freedom of Information Act requesters with all material to which they are legally entitled while protecting the statutory rights of the submitters of confidential information, as the Chrysler Corp. v. Brown case requires.

Frequently, the reviewing function of the Office of Legal Counsel is made more difficult by confidential treatment requests that are lacking in specific justifications and by broad and imprecise Freedom of Information Act requests. Moreover, many of the Freedom of Information Act and confidential treatment request appeals involve highly technical documents that must be reviewed on a line-by-line basis, as was required in our decision in the Citicorp Futures Corp. case. In order to clarify the procedures for submitting and processing Freedom of Information Act and confidential treatment requests, the Commission recently published proposed revisions of its FOIA rules. The Commission is considering the public comments submitted in response to these proposed rules and anticipates publishing final rules early this spring.

SOVIET GRAIN SALE

Mr. WHITTEN. The following article appeared in the paper (Washington Post) on January 16:

SOVIET RUMORS PUSH GRAIN PRICES UP

Unconfirmed rumors that the Soviet Union has quietly been buying corn, soybeans and soybean meal from U.S. suppliers pushed up futures prices yesterday on the Chicago Board of Trade.

The rumors stem in part from the severe drought in Brazil, where the Russians have been buying some of their needed grain. As a result, the Russians need to buy more grain from the United States, these rumors maintain. Although unconfirmed, the rumors were enough to force the futures market higher.

"While these are rumors only, and we've had them before, it's very possible that the Russians are doing this," said Dale Durchholz, an analyst with G. H. Miller & Co.

In light of this continuing situation, how do we know whether foreign governments or entities are engaged in a coordinated action which constitutes insider trading on a grand scale? For example, what mechanisms do you have in place which would discover a well-thought out move by a commodity board or a foreign national government to engage in futures transactions based on their own intentions to buy or sell large quantities at a future date? Can you state unequivocally that this did not happen in conjunction with the Russian grain sale? How might options trading in agricultural commodities affect the risk of pricing manipulations by foreign governments?

RESPONSE. The Commission has in place a comprehensive large trader reporting system that requires the disclosure of all positions in any delivery month which exceed 500,000 bushels of corn or soybeans or 15,000 tons of soybean meal. These reports cover foreign as well as domestic, government as well as private, traders. Through this reporting system, the Commission can begin a review of allegations that a foreign government established long futures positions prior to the public announcement of a large purchase in the cash market. If the time interval between the establishment of the futures position and the public disclosure of the cash purchase is more than a day, these data may be adequate for surveillance purposes. If the time interval is less than that, however, then the exchange audit trail enhancements that the Commission has been advocating are essential. Our surveillance data, however, provide no indication that the Soviet Union ever established positions in U.S. futures markets.

The introduction of agricultural options has no material effect on the risk of price manipulation because of the manner in which the agricultural options pilot program is designed. Comparable reporting requirements are in place for options to complement the surveillance information for futures positions. More significantly, the expiration date of the option precedes the delivery period of the underlying grain futures contract by several weeks. This feature of the grain option contracts greatly reduces the potential for large option exercises or other activities in the option market to contribute toward the manipulation of the underlying futures price or to have an adverse impact upon the cash market. Our surveillance of options markets to date has encountered no such problems.

AUDIT TRAIL ENHANCEMENT

Mr. WHITTEN. Please give us a concise summary of the issues, as well as the substance of the regulation you published on audit trail enhancement.

RESPONSE. Attached is a Commission press release which summarizes the Commission's new regulation requiring improved audit trails. The Commission notes that the regulation establishes a performance standard which permits each exchange to select the method for compliance with the regulation—manual recordation of trade execution times is not required.

[The information follows:]

NEWS RELEASE

Release: 2486-86

For Release: Tuesday, January 14, 1986

Contact: Kate Hathaway

(202) 254-8630

Washington--The Commodity Futures Trading Commission met today and voted unanimously to approve rule amendments designed to improve the trade-timing record required under regulation 1.35(e).

The approved final rules require that the actual execution time of each futures and option trade be stated on the trade register in one-minute increments. The amended regulation does not specify the method for meeting this trade-timing standard, but permits each exchange to comply with the perscribed trade-timing standard as it chooses. (See press release 2483-86 for further detail).

The final rule "provides a realistic lead time for the exchanges to implement the required changes," according to Commissioner Hineman. Although the rule was approved today, the exchanges have until July 1, 1986 to report on a proposed trade-timing system. Effective compliance with the rules is required by October 1, 1986 and three months later, on January 1, 1987, each exchange is required to demonstrate the ability to reconstruct trading rapidly and accurately using trade register data in order to identify and prove or disprove trading abuses.

In the Commission's discussion of the audit trail, Commissioner Robert Davis began with a statement that recognized that "the greatest safeguards against abusive trading practices

are inherent in the system of futures trading itself . . . a good audit trail will enhance and strengthen the natural deterrents, not replace them." Commissioner Davis also raised some concerns about compliance with the new audit trail rules. He pointed out that "compliance criteria will evolve with further experience . . . Most certainly the criteria will require that all classes of traders be covered by the timing standard, and that a concerted effort be maintained to improve the timing accuracy for each class of trader. In the meantime, the exchanges and other market participants should rest assured that the Commission will pursue a stronger audit trail while heeding the possible impact such rules may have on brokers, traders and the efficiency of markets."

Commissioner William Seale questioned staff on developing appropriate rules allowing for opening and closing periods. Mrs. Corcoran responded that such rules were permitted under the proposal and would provide "relief" from the rules as originally proposed. Commissioner Seale urged the exchanges to develop trade-timing systems that will comply with the new and amended audit trail rules, expeditiously.

In his comments at the meeting, Commissioner Hineman underscored his strong support for an improved audit trail because it "will make it easier for Commission and exchange enforcement staffs to detect and prove or disprove possible violations in areas such as trading ahead of customers, wash trades, accommodation trades, other noncompetitive trading

practices, and speculative position limit violations."

In his statement at the meeting, Commissioner West said he wanted to make it clear that the direction for the audit trail proposal "came from the Commissioners." Commissioner West began his questions by clarifying the extent that exchange members trading for their own accounts are involved in trades occuring on certain markets. Andrea Corcoran, Director, Division of Trading and Markets, responded that in certain markets up to 70 percent of all trades can involve an exchange member trading for his own account on one or both sides of the trade, and up to 50 percent of all trades executed can involve exchange members trading for their own accounts opposite other members also trading for their own accounts. This, Commisioner West contended, emphasized the need to record transaction data for members who trade their own account.

In arguing for the need of an improved audit trail, Commissioner West referred to a recent Commission study of alleged manipulation of the markets which experienced delay in completion because an "inadequate audit trail did not allow a rapid determination of what trading has transpired within each half hour time bracket." In relation to this study, "the Commission again cited the need for a detailed, accurate audit trail to permit accurate reconstruction of trading to better analyze intraday trading patterns and their impact on intraday price movements."

Before calling for the vote, Chairman Susan Phillips summarized by saying the Commission "had thought long and hard" about this proposal and that complete and accurate reporting of transactions is essential for these markets to continue to grow and to attract new participants. People will only come to and stay in these markets if they believe they are getting fair executions and have an adequate record upon which to resolve disputes. She concluded by saying "improved audit trails must be a developing process" and that "the Commission looks forward to working with the exchanges and other interested parties as they develop their systems so that these competitive markets can meet their full potential."

A copy of the new rules, including the accompanying memorandum, is available from the Office of the Secretariat, CFTC, 2033 K Street, N.W., Washington, D.C. 20581, (202) 254-6314.

NFA STUDY

Mr. WHITTEN. Please give us a concise summary of your study of the NFA over the past year.

RESPONSE. Attached is a Commission press release which summarizes the Commission's recent report to Congress on the National Futures Association and which includes the executive summary of that report.

[The information follows:]

ADVISORY

99-85

Contact: Kate Hathaway Gail Stover (202/254-8630)

For Release: Tuesday
December 31, 1985

Washington--The Commodity Futures Trading Commission issued a report to Congress today on the progress of the National Futures Association (NFA) in implementing its self-regulatory program as mandated under the Commodity Exchange Act and Commission rules. The NFA was registered by the Commission as an industry-wide self-regulatory organization on September 22, 1981.

In the Futures Trading Act of 1982, NFA was directed to adopt and implement rules that:

(1) establish training standards and proficiency testing for commodity futures professionals registered with the Commission,

(2) establish minimum capital, segregation and other financial requirements for its members,

(3) establish minimum sales practice standards for its members, and

(4) develop a comprehensive program that fully implements these rules.

Based on continuing review and oversight of NFA during the past four years, the Commission finds that "NFA generally has succeeded in meeting its mandate under the Futures Trading Act of 1982 to adopt and implement . . . a comprehensive self-regulatory program in the public interest." Although the Commission expects that the programs NFA has established will meet the minimum requirements established by Congress and the Commission, such self-regulatory programs are evolving; therefore, the Commission expects to continue monitoring NFA's further progress to assure it performs adequately and properly implements the comprehensive programs specified in the Act.

In the Futures Trading Act of 1982, Congress directed the Commission to report to the Congress on the regulatory performance of NFA by no later than January 1, 1986.

Attached is a five-page Executive Summary of the report which was sent to Congress. Anyone wishing to receive the full report should contact the Commission's Office of Communication and Education Services, 2033 K Street, N.W., Washington, D.C. 20581, (202-254-8630). There is no charge associated with the report.

Executive Summary

Report to Congress by the

COMMODITY FUTURES TRADING COMMISSION

on the

NATIONAL FUTURES ASSOCIATION

The National Futures Association ("NFA") was formally registered by the Commodity Futures Trading Commission Commission on September 22, 1981, as the first -- and thus far, the only -- "registered futures association" authorized to assume responsibility for direct, industry-wide self-regulation under the Commodity Exchange Act ("Act"). The concept of such an industry-wide self-regulatory body was first articulated by Congress in the 1974 amendments to the Act and became a central theme in the deliberations surrounding the Commission's 1982 legislative reauthorization as Congress endeavored to address the need for improved customer protection in the commodities industry, without impeding growth and innovation in the industry in an environment of Federal budget restraint. NFA appeared to be a potential vehicle for achieving both of these objectives.

Because of the importance of the newly created NFA to the 1982 deliberations, Congress, in the Futures Trading Act of 1982, directed the Commission to report, by no later than January 1, 1986, on the regulatory experience of NFA through September 30, 1985, and provided specific NFA performance objectives as a framework for the Commission's oversight and evaluation. NFA was directed through a new Section 17(p) of the Act to adopt rules that:

> (1) Establish training standards and proficiency testing for persons involved in the solicitation of transactions subject to the provisions of [the Commodity Exchange] Act, supervisors of such persons, and all persons for which it has registration responsibilities, and a program to audit and enforce compliance with such standards;

(2) Establish minimum capital, segregation, and other financial requirements applicable to its members for which such requirements are imposed by the Commission and implement a program to audit and enforce compliance with such requirements, except that such requirements may not be less stringent than those imposed on such firms by [the] Act or by Commission regulation; and

(3) Establish minimum standards governing the sales practices of its members and persons associated therewith for transactions subject to the provisions of [the] Act.

Congress also specified, in a new Section 17(q), that NFA was to "develop a comprehensive program that fully implements" the rules required by Section 17(p), as well as all other rules of NFA that had been approved by the Commission. That program was to be established "as soon as practicable" but in any event was to be fully effective "not later than September 30, 1985."

Based on its continuing review and oversight of NFA during the past four years, the Commission finds that NFA generally has succeeded in meeting its mandate under the Futures Trading Act of 1982 to adopt and, with certain exceptions, to implement a comprehensive self-regulatory program in the public interest. As of September 30, 1985, NFA had put into place a program reasonably designed to result in effective fulfillment of each of the specific objectives established by the Futures Trading Act of 1982. Some of the components of this self-regulatory program were not operational on September 30, 1985, however, and the Commission has not, therefore, assessed the execution of those aspects of NFA's program in its Report.

The emergence of NFA has been one of the components in a dramatic improvement in the scope and quality of futures industry regulation over the past five years. NFA's unique role in the futures regulatory scheme is attributable partly to the fact that the Association exists solely for the purpose of self-regulation and has no separate commercial or economic

functions. By comparison, the designated commodity exchanges (or "contract markets") have a proprietary purpose -- the trading of futures and option contracts.

NFA has promulgated rules in each of the program areas specified in the 1982 legislation -- proficiency standards and testing; minimum capital, segregation, and other financial requirements; and sales practices -- and has also established effective arbitration, membership and disciplinary programs necessary to its continued registration under the Act. NFA has also established effective sales practice and financial audit programs for those of its members which are not also exchange members. Certain aspects of NFA's self-regulatory program are not yet fully operational, however. In particular, as of September 30, 1985 (the end of the statutory evaluation period), a segregation audit program covering that portion of NFA's membership which also belongs to one of the commodity exchanges had only been in place for two months; similarly, while one exchange had voluntarily initiated a branch office sales practice examination program, NFA was only then concluding its agreements with four of the exchanges to conduct sales practice audits on NFA's behalf. Conclusions about the ultimate quality and effectiveness of these critical programs cannot, therefore, be drawn at this time.

In this connection, the Commission expects to continue to audit NFA's programs periodically as it does the programs of the contract markets. To facilitate this oversight process, the Commission is proposing statutory revisions to assure that its authority with respect to NFA is consistent with and at least as effective as its already-existing authority with respect to the designated commodity exchanges.

Organizationally, NFA membership has grown to the levels originally contemplated and the Association has established a structure and staff capable of carrying out an effective program of self-regulatory rule-setting and compliance. Throughout this initial evaluation period, NFA has maintained an effective working relationship with the Commission, including close coordination between NFA and Commission staff in the development of NFA rules and program implementation. The Commission created a formal liaison with NFA in January 1983 in order to have a staff component whose principal function would be to monitor the activities of that developing organization. Among the liaison's duties are the review of all proposed NFA rules and the coordination of the Commission's response to other proposed NFA initiatives. As discussed in the Report, the Commission has also conducted several oversight studies of NFA's regulatory program, and NFA has been generally responsive to suggestions and comments resulting from those reviews.

The impact on the Commission's operations as a result of the successful implementation of NFA's programs thus far has been material. Relieved of several resource-intensive functions and responsibility for most direct regulation, the Commission has been able to address its primary regulatory responsibilities in a more efficient and expeditious manner, to upgrade the quality of its formerly criticized oversight and surveillance efforts, and to prepare for and react to innovation and substantial growth without a comparable expansion of its staff. This redirection of Commission energies has been toward the Commission's primary functions of market surveillance, oversight, enforcement, and policy development.

In measuring the cost savings attributable to the operations and activities of NFA, the Commission has endeavored to quantify the direct, tangible savings that resulted from the transfer to NFA of various functions

(such as registration processing) that had formerly been performed by the Commission. The direct savings to the Commission that have thus far resulted from the implementation of NFA's regulatory program represent actual Commission staff and other resources formerly dedicated to functions that have been transferred to NFA and which have now been redirected to other Commission priorities or eliminated -- estimated to total $3.5 million during the period from fiscal year 1983 through fiscal year 1985. In addition, the Commission examined the potential costs avoided by NFA's assumption of new and expanded self-regulatory programs and benefits to the futures industry and the public provided by other NFA self-regulatory services.

In conclusion, the Commission has determined that NFA's various self-regulatory programs generally meet the minimum requirements established by Congress and the Commission. These programs, however, are evolving, not static, and the Commission expects that they will be supplemented and become even more effective in the years ahead. The Commission therefore expects to continue to monitor NFA's further progress in order to ensure that NFA continues to perform adequately and properly implements the comprehensive program specified in the Act.

FARM LEGISLATION

Mr. WHITTEN. What effect will recently enacted farm legislation have on farmers' participation in futures markets?

RESPONSE. We believe that the recently enacted farm legislation with its significantly reduced loan levels may result in farmer participation in futures markets rising to customary levels. With prices above market prices, farmers have a strong incentive to put their crops under loan—and perhaps ultimately forfeit the crop to the Commodity Credit Corporation—rather than hedge the crop or forward contract it with a merchandiser or processor. However, if under the new farm program domestic prices are no longer supported significantly above world price levels, farmers will once again have to face the price uncertainties resulting from fluctuating international supply and demand conditions. In those circumstances, more farmers may find it once again to be in their interest to hedge their crops. They may do so through the use of futures positions, options positions, or forward contracts. While farmers tend to favor forward contracts, the issuers of those contracts generally hedge them in the futures or options markets. Thus, exchange volume in agricultural contracts is likely to increase in either case.

STAFF-YEAR JUSTIFICATION

Mrs. SMITH. Given the increase in efficiency and technology, how do you justify an increase in staff-years when every office at USDA has to cut back?

RESPONSE. While I cannot speak to the effect on offices at USDA, I know that the Commission, like many independent regulatory agencies, has already reaped the benefits of increases in efficiency and technology. For example, in FY 1985 the Commission was appropriated funds for a staffing level of 533. In FY 1986 we will only be able to fund 493 staff-years. The Commission has only been able to achieve this reduction through a combination of increasing efficiency and productivity, transferring of certain functions to self-regulatory organizations, and planning to ensure that our scarce resources are allocated to our highest priorities. The 15 additional staff-years requested for FY 1987 will restore some critical staff, which were lost in this year's reduction, to areas such as the Enforcement Program. The restoration of these staff-years will also assist the Commission in meeting the regulatory demands placed on it by the growth in the futures and options markets. Volume in these markets has grown from about 28 million contracts traded in FY 1974 to 83 million in FY 1980 to 170 million in FY 1985.

USER FEES

Mrs. SMITH. Have you given any thought to the implementation of a user fee systems to cover your costs?

RESPONSE. Implementation of a fee on commodity futures and option transactions, which could cover the cost of the CFTC, would require congressional action. The Congress considered and rejected such a proposal in 1982. As I previously noted, the Commission does collect about $1 million in service fees per year which are deposited directly in the U.S. Treasury.

COST OF REAUTHORIZATION

Mrs. SMITH. How much appropriated money is spent on your reauthorization efforts?

RESPONSE. Records of staff time in the agency's Budget Account Code System show that the Commission spent about $12,000 in staff time on reauthorization in FY 1985. Through February 1 in FY 1986, the Commission has spent an additional $16,000 in staff time. The Commissioners and their staffs do not record their time by project in the Budget Account Code System. However, it is estimated that another $40,000 has been spent on time devoted by the Commissioners and their staff to the reauthorization effort.

1985 FARM BILL

Mr. WATKINS. A provision in the 1985 Farm Bill, directs the Secretary of Agriculture to make a study to find out how producers of grains, soybeans and cotton might use commodity futures and options markets to protect their incomes and to find out how this might affect federal farm program costs. Do you believe this will prove or disprove the theory that this is an effective tool?

The advisory panel to study the matter will be composed of farmers, processors, exporters and commodity traders. Have you made recommendations to the Secretary as to what level each group will be represented on the panel?

Do you believe that the farmer representation on this panel should be in the majority in order to get an equitable, fair report?

The study will also conduct a pilot program in which farmers will be offered a chance to participate in a test of the use of commodity markets. Has USDA narrowed which 40 counties will be involved in the study?

What role will CFTC play in this study?

Will the CFTC help the Secretary design the pilot program?

Has the CFTC designed an extensive educational program for the producers in the selected pilot counties?

If this test is successful, do you have plans for further programs of this magnitude?

RESPONSE. The Commission has contacted the Department of Agriculture to inform the Secretary it is ready to assist and advise USDA in this study and in the pilot training program for farmers, in accordance with the amendment.

The outcome of the proposed study will depend upon the scope, analysis, methodology and objectives of the study USDA undertakes.

To date, USDA has not requested any recommendations or information from the Commission concerning any phase of the study or representation on the advisory panel. While the Commission has made no recommendations about the representation of various groups on the advisory panel, a carefully selected, knowledgeable balanced advisory group would produce an objective report.

The Commission has not been informed by USDA about its plans concerning the selection of the 40 counties that will be involved in the pilot training program.

The 1985 Farm Bill amendment states the Commission's role will be an advisory one to the Department of Agriculture; therefore, the Commission will play an advisory role as stated in the amendment, in cooperation with USDA, in the study and pilot training program for farmers.

Given current budget constraints, the Commission has no plans, at this time, for further programs or studies similar to the one prescribed in the amendment to the 1985 Farm Bill.

EDUCATIONAL MEETINGS

Mr. WATKINS. How many meetings were held last year to educate various groups about the CFTC's activities and the use of commodity exchanges? How many were agriculture groups? Consumer groups? Active traders?

RESPONSE. Thirty-one meetings were held during the year to educate various groups about the CFTC's activities and the use of commodity futures markets. Eleven were held with agricultural groups, two with general consumer groups, and 18 with other organizations. These groups include financial, industry, academic, legal, and government organizations. None were specifically held with active traders.

DISTRIBUTION OF FACT SHEETS

Mr. WATKINS. How many materials, fact sheets, etc. on the use of commodity exchanges were distributed last year?

RESPONSE. Approximately 90,000 copies were distributed to academic institutions, consumers, students, farm and commodity organizations and financial institutions.

PLANNED EDUCATIONAL ACTIVITIES

Mr. WATKINS. What new educational programs are planned?

RESPONSE. The agency's education program has been severely curtailed because of Gramm-Rudman-Hollings budget limitations. The education unit has diminished in size through attrition and remaining education personnel have been assigned other duties to fulfill agency regulatory responsibilities. However, CFTC will cooperate to the fullest extent with the USDA Cooperative Extension Service in the programs proposed for the marketing study and pilot marketing training program proposed in the 1985 Farm Bill.

YOUTH EDUCATION PROGRAMS

Mr. WATKINS. What is the status of youth education programs?

RESPONSE. Budget cut-backs have generally curtailed the CFTC education program. Under these limited budget conditions, the Commission will have to focus its

educational efforts on areas of need where other educational resources are not already abundantly committed.

Several other organization, including the 4-H and Future Farmers of America and the National Association of Vo Ag teachers, are committed already to youth education efforts in the agricultural area.

FARMERS' USE OF OPTIONS

Mr. WATKINS. What is the status of farmers' use of options in the futures exchanges?

RESPONSE. Neither the Commission nor the futures exchanges routinely collect data that indicate the extent to which farmers use commodity option markets. However, each month future exchanges provide data to the Commission indicating the percentage of open contracts held by commercial and non-commercial accounts. Commercial accounts include those controlled by farmers, merchants, processors, etc. Data for month-end positions during the last quarter of 1985 indicate that commercials have contributed from 25 to 50 percent of open interest in the four most actively traded agricultural options contracts. An average of about 25 percent of the open interest of Chicago Board of Trade—CBT—soybean options and approximately 33 percent of CBT corn options was commercial. About 33 percent of the open interest in put options on the Chicago Mercantile Exchange's live hog and live cattle futures contracts and 50 percent of the call open interest in these contracts was controlled by commercials.

Mr. WATKINS. There has been some concern that CFTC has been reluctant to approve more options contracts. Is the CFTC dragging its feet in approving further contracts?

RESPONSE. No, quite to the contrary. Seventeen non-agricultural and ten agricultural option contracts were approved by the Commission between initiation of the respective pilot programs and December 31, 1985. The average period between submission of a contract and its consideration by the Commission was 7.8 months for the last 20 contracts received through December 1985. This time includes lags associated with waiting for exchange responses to correct contract deficiencies. Adjusted for the tolling period, the average time period was 7 months. The Commission considered two additional non-agricultural option contracts on March 4, 1986, and expects to consider three more on March 21, 1986. The review time for these contracts has been condsiderably shorter—approximately 5 months.

The Commission has voted several times to expand the non-agricultural pilot program to permit the listing of additional option contracts after reviewing its experience and assuring its ability to regulate an expanded option program. The Commission initially permitted each exchange to list non-agricultural options on one physical commodity and one futures contract. In late 1982, the Commission voted to allow exchanges to offer two options of either type rather than one of each. In August 1984, the Commission expanded the program to allow five contracts per exchange, and in October of last year this limit was increased to eight contracts per exchange.

At the initiation of the agricultural options pilot program, each exchange again was limited to listing two agricultural options. This limitation was adopted to facilitate the detection and correction of potential problems by both the exchange and CFTC staffs. Given the Commission's positive experience with the agricultural pilot program over the last sixteen months, the Commission will consider on April 2, 1986, an expansion of the agricultural option pilot program to permit an exchange to offer up to five agricultural option contracts.

EXPANSION OF OPTION PILOT PROGRAM

Mr. WATKINS. How soon do we expect to see more contracts approved?

RESPONSE. Option contracts continue to be approved for trading under the Commission's non-agricultural option pilot program. On March 4, 1986, the Commission approved the Chicago Board of Trade's option contract on the European Currency Unit for physical delivery and the Chicago Mercantile Exchange's option on the futures contract for the Japanese yen. On March 21, 1986, the Commission also approved options on futures contracts for municipal bonds, Chicago Board of Trade; three-month Treasury bills, Chicago Mercantile Exchange; and copper, Commodity Exchange, Inc.

Also, with respect to the agricultural pilot program, the Commission has announced that it will consider an expansion of the program at a public meeting on April 2, 1986. If the Commission determines to expand the agricultural pilot program at that time, this expansion will become effective following transmittal to the House Committee on Agriculture and the Senate Committee on Agriculture, Nutri-

tion and Forestry of documentation indicating the Commission's ability to regulate such an expanded program and the expiration of 30 calendar days of continuous session of the Congress. To date the average period of time for staff review of agricultural options has been approximately seven months. Therefore, if the agricultural pilot program is expanded and exchanges submit new contracts as soon as any expansion becomes effective, new contracts could be designated for trading before the end of 1986.

FARMER EDUCATION

Mr. WATKINS. What kind of educational program is in place for educating farmers on the use of options?

RESPONSE. During 1983-84, the Commission was involved in an extensive education program concerning domestic agricultural options directed toward producers, producer organizations, ag lenders, and relevant agri-businesses. We believe this effort is now paying off with the dissemination of educational information on options and other market alternatives through the USDA's publication "Farmers' Guide to Trading Agricultural Options," which was produced with the assistance of CFTC personnel.

The Commission also has assisted the USDA Cooperative Extension Service in developing a futures training program—Agricultural Commodity Options: A Teacher's Guide in three volumes—for state extension specialists geared toward producers. While the program's major emphasis is on futures and options, it includes all marketing alternatives for farmers. This educational program is available to the producer in all farm states.

In addition to these broad-based educational efforts, the Commission specifically targets producers in its education program by working with various commodity groups and farm organizations. Ten of these groups have organized futures committees or designated individuals to develop educational programs about futures markets for their membership and to keep their membership informed about other educational resources regarding futures markets.

The Commission transmits important information to the agricultural community through its publication, AgReport. With a combined subscription list of 800 individuals, universities, farm organizations, and state agencies, this publication reaches many key groups in the agricultural sector. AgReport contains extensive articles on the use of agricultural options articles contained in recent issues have been reprinted and distributed separately.

Finally, the CFTC has organized an Agricultural Advisory Committee to advise the Commission about a wide array of agricultural issues affecting producers and to serve as an educational link with the agricultural community. Patterned after a similar committee which was very successful in assisting the Commission with the agricultural option pilot program, the Agricultural Advisory Committee not only serves as a means of getting input from the agricultural community, but also helps the Commission reach agricultural organizations through direct contact with committee representatives.

EDUCATIONAL PROGRAM

Mr. WATKINS. Do you plan to increase your educational program on the use of options?

RESPONSE. The Commission plans to maintain its current broad-based educational program including its efforts in cooperation with other farm organizations and commodity groups to increase the education and information available to farmers and others in the agricultural sector on farm options. Furthermore, CFTC will cooperate to the fullest extent with the USDA Cooperative Extension Service in the programs proposed for the marketing study and pilot marketing training program amended to the 1985 Farm Bill.

No new education programs are planned at this time because of the budget constraints the education unit, and the Commission as a whole, faces.

MARKET SURVEILLANCE ACTIVITIES

Mr. WATKINS. There has been concern that trading on the futures markets manipulates the market price of commodities. Is there any validity to this claim and if not, what is being done to educate those with these beliefs?

RESPONSE. Futures markets are integrally related with cash markets and cash price determination. Futures prices play an important price discovery role for many commodities by continuously and openly evaluating, through the competitive auc-

tion process, fundamental supply and demand conditions for a commodity and by providing a price-basing standard for commercial transactions. While this feature of futures markets enables them to serve very important economic functions, it also means that any manipulation of futures markets can adversely influence cash prices. The Commission is very aware of this important linkage between cash and futures markets, and through its daily Market Surveillance program it actively works to prevent manipulation from occurring. The Commission also makes sure that exchanges are diligently exercising their responsibilities regarding the prevention of price manipulation through cooperative surveillance activities when market problems arise and through periodic reviews of exchange market surveillance programs.

The Commission works to make known its market surveillance activities in a variety of ways. We have working with various industry groups, particularly in agriculture, to explain Commission programs and to respond to industry questions and concerns. We plan to continue these important efforts. In addition, the major exchanges have extensive education programs for farm groups as well as other market users which are directed at providing information on the nature of the markets, their uses and the market and customer protections provided.

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TESTIMONY OF SUSAN M. PHILLIPS
CHAIRMAN, COMMODITY FUTURES TRADING COMMISSION
BEFORE THE
SUBCOMMITTEE ON AGRICULTURE, RURAL DEVELOPMENT
AND RELATED AGENCIES
COMMITTEE ON APPROPRIATIONS
UNITED STATES HOUSE OF RESPRESENTATIVES
MARCH 13, 1986

DEAR MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE:

I APPRECIATE THE OPPORTUNITY TO APPEAR BEFORE YOU TODAY TO SUMMARIZE THE FY 1987 BUDGET REQUEST OF THE COMMODITY FUTURES TRADING COMMISSION. I AM ACCOMPANIED TODAY BY MOLLY BAYLEY, THE EXECUTIVE DIRECTOR OF THE COMMISSION, AND BY RUSSELL CHERRY, THE BUDGET DIRECTOR.

THE FY 1987 BUDGET REQUEST FOR THE COMMISSION IS $30,418,000, AN INCREASE OF $2,435,000 OVER THE FY 1986 POST-GRAMM-RUDMAN LEVEL. THE REQUESTED FY 1987 LEVEL WILL ALLOW THE COMMISSION TO MAINTAIN ITS FY 1986 OPERATING LEVEL, MEET INCREASES IN RENT AND OTHER FIXED COSTS AND TO FUND 508 STAFF-YEARS, AN INCREASE OF 15 OVER THE FUNDED FY-1986 STAFF-YEAR LEVEL OF 493. BOTH THE FY 1986 AND PROPOSED FY 1987 STAFFING LEVELS ARE SUBSTANTIALLY BELOW THE COMMISSION'S AUTHORIZED FY 1985 LEVEL OF 533 STAFF-YEARS.

THE COMMISSION'S STAFFING LEVEL HAS NOT KEPT PACE WITH THE GROWTH IN THE INDUSTRY. THE VOLUME OF TRADING HAS GROWN FROM ABOUT 41 MILLION CONTRACTS IN FY 1977 TO 170 MILLION IN FY 1985, AN INCREASE OF OVER 300 PERCENT, WHILE CFTC STAFFING LEVELS HAVE INCREASED ONLY 17 PERCENT DURING THE SAME PERIOD. THERE HAS ALSO BEEN SIGNIFICANT GROWTH AND CHANGE IN THE REGULATED INDUSTRY. TWO EXCHANGES HAVE CLOSED, TWO HAVE MERGED AND FOUR NEW EXCHANGES HAVE OPENED. THE AVERAGE AMOUNT OF CUSTOMER FUNDS CARRIED BY A FUTURES COMMISSION MERCHANT HAS GROWN FROM $8.7 MILLION IN 1980 TO $27.6 MILLION TODAY.

THE ISSUES WHICH FACE THE COMMISSION ARE ALSO BECOMING INCREASINGLY COMPLEX. THE COMMISSION MUST CONSTANTLY STAY ABREAST OF THE CASH MARKETS AS WELL AS THE FUTURES AND OPTIONS CONTRACTS THEMSELVES IN ORDER TO BE ABLE TO ANTICIPATE, UNDERSTAND AND RESPOND TO CHANGES AS THEY OCCUR. FOR EXAMPLE, CHANGES IN THE AGRICULTURAL MARKETS, SUCH AS THE DEREGULATION OF RAIL RATES AND NEW STORAGE AND PROCESSING TECHNOLOGIES, REQUIRE CONSIDERABLE OVERSIGHT

TO ASSURE THAT TERMS AND CONDITIONS OF TRADITIONAL CONTRACTS ARE KEPT IN LINE WITH CONDITIONS IN THE CASH MARKETS. OTHER INDUSTRIES, SUCH AS THE PETROLEUM INDUSTRY, ARE UNDERGOING RAPID CHANGES AS A RESULT OF INTERNATIONAL FACTORS. THE INCREASING INTERNATIONALIZATION OF TRADING, THROUGH LINKED EXCHANGES FOR INSTANCE, ALSO PLACES INCREASED DEMANDS ON THE COMMISSION.

THE COMMISSION HAS BEEN ABLE TO MEET THE CHALLENGE OF COPING WITH ITS GROWING RESPONSIBILITIES WITH A REDUCED STAFF ONLY BY INCREASING PRODUCTIVITY, AUTOMATING CERTAIN FUNCTIONS, STREAMLINING PROGRAMS, ENCOURAGING STATE AUTHORITIES TO TAKE ENFORCEMENT ACTIONS WITHIN THEIR JURISDICTION, AND DELEGATING CERTAIN FUNCTIONS TO THE NATIONAL FUTURES ASSOCIATION. ALL OF THESE ACTIONS HAVE BEEN TAKEN IN THE CONTEXT OF PRIORITIES SET BY THE COMMISSION AS PART OF A PLANNING PROCESS WHICH IDENTIFIED THE COMMISSION'S LONG-RANGE GOALS AND OBJECTIVES. THIS PROCESS LED TO THE DEVELOPMENT OF THE COMMISSION'S FIVE-YEAR PLAN FOR THE DEVELOPMENT OF AUTOMATED DATA PROCESSING TOOLS. IN ADDITION, THE COMMISSION UNDERTOOK A THOROUGH REVIEW OF ITS OPERATING EXPENSES TO DETERMINE HOW IT COULD REDUCE EXPENDITURES WHEREVER POSSIBLE.

NEVERTHELESS, THE COMMISSION IS FACING A DIFFICULT YEAR AT THE FY 1986 STAFFING LEVEL. AS YOU KNOW, THE COMMISSION IS CURRENTLY INVOLVED IN THE REAUTHORIZATION PROCESS. THE REAUTHORIZATION BEING SOUGHT BY THE COMMISSION IS FAIRLY SIMPLE AND STRAIGHTFORWARD -- THE COMMISSION IS SEEKING SEVERAL CHANGES IN ITS LEGISLATION TO CLARIFY AND STRENGTHEN ITS ENFORCEMENT AUTHORITY, TO MAKE THE COMMISSION'S OVERSIGHT OF NFA COMPARABLE TO ITS OVERSIGHT OF THE EXCHANGES, TO REMOVE LEVERAGE CONTRACTS FROM THE COMMISSION'S JURISDICTION AND TO EXTEND THE COMMISSION'S AUTHORIZATION FOR SIX YEARS. NONE OF THE COMMISSION'S LEGISLATIVE REQUESTS WILL INCREASE ITS JURISDICTION. SOME WILL REDUCE ITS REGULATORY RESPONSIBILITIES AND OTHERS WILL PERMIT STREAMLINING OF REGULATORY, ENFORCEMENT AND LITIGATION PROCEDURES. DESPITE THIS LIMITED

REAUTHORIZATION AGENDA, THE COMMISSION EXPECTS THAT A GREAT DEAL OF STAFF TIME WILL BE DEMANDED TO ACCOMPLISH THIS LEGISLATVIE INITIATIVE. SHOULD THE COMMISSION BE UNSUCCESSFUL OR BE ASKED BY CONGRESS TO ASSUME NEW, UNANTICIPATED RESPONSIBILITIES, THE COMMISSION'S BUDGET REQUEST MAY BE AMENDED OR SUPPLEMENTED.

ANOTHER MAJOR PROJECT DURING FY 1986 WILL BE IMPLEMENTATION OF THE AUDIT TRAIL RULES. THE COMMISSION PUBLISHED THESE RULES ON DECEMBER 27, 1984, SEEKING COMMENT ON WAYS TO IMPROVE EXCHANGE AUDIT TRAILS FOR MARKET SURVEILLANCE AND ENFORCEMENT PURPOSES. THE COMMISSION RECEIVED NUMEROUS COMMENT LETTERS AND ALSO RECEIVED ENCOURAGEMENT TO ADOPT THE RULES FROM THIS SUBCOMMITTEE IN ITS REPORT ON THE COMMISSION'S FY 1986 BUDGET REQUEST. THE RULES, WHICH REQUIRE THAT THE ACTUAL EXECUTION TIME OF EACH FUTURES AND OPTIONS TRADE BE RECORDED IN INCREMENTS OF NO MORE THAN ONE MINUTE, WERE ADOPTED UNANIMOUSLY BY THE COMMISSION ON JANUARY 14, 1986. THE RULES DO NOT SPECIFY THE METHOD FOR MEETING THIS TRADE-TIMING STANDARD, BUT PERMIT EACH EXCHANGE TO COMPLY WITH THE STANDARD AS IT CHOOSES. FOR INSTANCE, AN EXCHANGE COULD USE MANUAL RECORDATION, A TECHNOLOGY-ASSISTED SYSTEM, ORDER "EXIT" TIMES OR A COMBINATION OF THESE OR ANY OTHER APPROACH WHICH MEETS THE STANDARD. THE EXCHANGES HAVE UNTIL OCTOBER 1, 1986, TO IMPLEMENT THE NEW STANDARD. THREE MONTHS AFTER THE STANDARD BECOMES EFFECTIVE, THE EXCHANGE MUST BE ABLE TO DEMONSTRATE THAT THEY ARE USING THIS TRADE REGISTER DATA TO RECONSTRUCT TRADING ACCURATELY AND RAPIDLY IN ORDER TO IDENTIFY AND PROVE OR DISPROVE TRADING ABUSES.

IN CONCLUSION, TO ACCOMPLISH THE COMMISSION'S GOALS AND TO ADDRESS THE ANTICIPATED WORKLOAD FOR FY 1987, THE COMMISSION REQUESTS A FY 1987 APPROPRIATION OF $30,418,000. THIS AMOUNT WILL MAINTAIN THE COMMISSION'S FY 1986 OPERATING

LEVEL AND FUND AN INCREASE OF 15 STAFF-YEARS. THE ADDITIONAL STAFF-YEARS WOULD BE DIRECTED TO CRUCIAL AREAS IN ENFORCEMENT AND MARKET SURVEILLANCE, AND TO OVERSIGHT OF SELF-REGULATORY ORGANIZATIONS. THE COMMISSION TAKES PRIDE IN ITS ABILITY TO ACCOMPLISH A GREAT DEAL WITH FEW RESOURCES, AND EXPECTS TO CONTINUE TO MAKE GREAT STRIDES AT THE REQUESTED FY 1987 LEVEL.

I WILL BE HAPPY TO ANSWER ANY QUESTIONS FROM MEMBERS OF THE SUBCOMMITTEE.

1987 BUDGET
EXPLANATORY NOTES

Prepared for the
Committee on Appropriations

February 1986

COMMODITY FUTURES TRADING COMMISSION
2033 K Street, N.W., Washington, D.C. 20581
(202) 254-6970

Susan M. Phillips
Chairman

Dear Mr. Chairman:

With this letter I am pleased to transmit to you the Commodity Futures Trading Commission's FY 1987 Budget Explanatory Notes. The Notes reflect a funding level for the Commission of $30,418,000 as displayed in the President's budget. At this level the Commission will be able to fund 508 staff-years, an increase of 15 staff-years from the 493 level which the Commission is funding in FY 1986.

With this level of resources, the Commission believes it can meet its responsibilities to administer and enforce the Commodity Exchange Act. This budget submission assumes that no significant new regulatory programs will be assigned to the Commission as part of the 1986 reauthorization legislation, that industry projections for continued growth are accurate and that the Commission will not have regulatory responsibility for new leverage entrants and products. It should be noted that if any of these assumptions prove inaccurate and thereby increase the Commission's responsibility, corresponding changes to the Commission's budget may be sought.

Copies of this submission have also been transmitted to the House Committee on Agriculture and the Senate Committee on Agriculture, Nutrition and Forestry. If I can provide you with any further information on this matter, please do not hesitate to call.

Sincerely,

Susan M. Phillips

SUSAN M. PHILLIPS
Chairman

The Honorable Jamie L. Whitten
Chairman
Committee on Appropriations
U.S. House of Representatives
Washington, D.C. 20515

The Honorable Mark O. Hatfield
Chairman
Committee on Appropriations
U.S. Senate
Washington, D.C. 20510

Attachment

COMMODITY FUTURES TRADING COMMISSION

FY 1987 BUDGET EXPLANATORY NOTES

CONTENTS

	PAGE
Mission Statement	1
Summary	2
Exhibit 1 - Goals and Objectives	8
Biographical Information -- CFTC Commissioners	9
Charts	12
History of FY 1987 Budget Request	12
Summary of Increases and Decreases	13
Object Classification	14
Executive Level Positions	15
Geographical Distribution of Obligations and Employment	16
Number of Contracts Traded	17
Number of Registered Commodity Professionals	18
Number of CFTC Staff	19
Major Activities of CFTC Offices and Divisions	20
Organizational Chart	21
Agency Direction	22
Enforcement	28
Market Surveillance, Analysis and Research	38
Registration, Audits and Contract Markets	51
Administrative Support Services	71
Proceedings	79
Legal Counsel	82
Appendix A -- Automated Data Processing Budget	88
Report on Obligations for Information Technology Systems (A-11-43A)	88
Estimate of FY 1986 ADP Obligations	89
Estimate of FY 1987 ADP Obligations	91
Appendix B -- CFTC Performance Statistics	93
Appendix C -- Status of Futures Trading - FY 1985	103

COMMODITY FUTURES TRADING COMMISSION

BUDGET EXPLANATORY NOTES

FISCAL YEAR 1987

MISSION STATEMENT

The Commodity Futures Trading Commission (CFTC) administers the Commodity Exchange Act, as amended, 7 U.S.C. §1, et seq. The mission of the agency is to regulate and oversee the commodity futures industry in order to foster an openly competitive market environment that serves the economic functions of risk shifting and price discovery, and to protect the public and the markets from price manipulation and fraud.

The major program activities of the Commission are (1) Market Surveillance, Analysis and Research; (2) Enforcement; (3) Registration, Audits and Contract Markets; (4) Proceedings; (5) Legal Counsel; (6) Agency Direction; and, (7) Administrative Support Services. These program activities are carried out in Washington, D.C. and in regional offices located in Chicago, New York, Kansas City and Los Angeles. A branch office operates in Minneapolis.

SUMMARY

On April 21, 1985, the Commodity Futures Trading Commission celebrated its tenth anniversary. In this 10 year period there has been phenomenal growth in the regulated industry, measured by increases in volume of trading (27.7 million contracts in 1974 to 149.4 million in 1984) and the number of commodity professionals registered with the CFTC (26,000 in FY 1976 to about 70,000 in FY 1985). In that period of time, two exchanges have closed; two have merged; four new exchanges have opened; a fifth has initiated the application process; and yet another exchange closed and reopened in another city. In addition, the average amount of customer funds carried by a futures commission merchant has grown from $0.5 million in 1971 to $8.7 million in 1980 to $27.6 million today. By any measure, the industry overseen by the CFTC is dynamic and growing.

As might be expected in these circumstances, the Commission has only been able to meet the challenge of its growing responsibilities by increasing productivity, automating certain operations, streamlining programs, encouraging state authorities to bring enforcement actions against fraudulent commodities operators and delegating certain functions to industry self-regulatory organizations. The CFTC's increasing reliance on industry self-regulation is possible through the Commission's maintaining active oversight of the industry and vigorous enforcement action against wrongdoers. The results of this combination have been growth in the volume, diversity and usefulness of the markets overseen by a Commodity Futures Trading Commission staff whose growth has not kept pace with that of the markets it oversees.

In recognition of the fact that the Commission's staff will continue to be lean through FY 1987, the Commission undertook two long-range planning projects in FY 1985. First, the Commission developed a five-year Automated Data Processing (ADP) plan. The plan, which is being implemented in FY 1986, will allow the Commission to continue to rely on ADP to improve the efficiency and effectiveness of its limited resources. In addition, the Commission undertook a long-range corporate and operating planning program. The Commission began this process by refining its mission statements for the agency as a whole and for each Division. Commission programs were ranked in order of priority in order to ensure maximum efficiency in the allocation of the Commission's scarce resources. Specific functions within those programs were reviewed and, as a result of this evaluation, some activities will be delegated to self-regulatory organizations (SROs), some will be streamlined and some curtailed. Goals and objectives were set which will guide the operations of the Commission through FY 1987. (These goals and objectives are attached as Exhibit 1 to this Summary.)

Continuation of this planning effort is crucial in view of the fact that the industry and the agency's regulatory responsibilities are growing. The markets which the Commission regulates and, therefore, the issues with which the Commission must deal, are becoming increasingly complex. For example, changing conditions in the agricultural markets, such as the deregulation of rail rates and new storage and processing technologies, require considerable oversight to assure that terms and conditions of traditional contracts are kept in line with conditions in the cash market. New contract terms must be considered to assure that the futures contracts are consistent with changing market conditions. The extreme volatility in some cash markets (e.g., 1983 soybeans and spring and summer 1985 cattle) require Commission resources to monitor related futures markets and to respond to public demands for analyses of these markets. In other markets, changes in marketing or distribution channels occur. For example, in the fall of 1984, differences between current cash market practices for delivery containers and the terms and conditions of the orange juice futures contract aggravated by tight supply conditions caused serious difficulties in the futures market. Changes in that contract have subsequently been approved by the Commission.

The Commission must continually stay abreast of these changes in the underlying cash markets, maintain familiarity with contracts, oversee the exchanges to assure that appropriate changes to contracts are made and work with exchanges to resolve trading problems as they arise. Some industries, for example, petroleum, are undergoing rapid changes as a result of international factors, which will continue to affect the futures markets. If the Commission is to fulfill its mission, it must have the resources to understand, stay abreast of and respond to such developments.

In addition, the Commission's responsibilities have expanded and become more complex with the growing internationalization of the markets and the advent of international links between domestic and foreign exchanges. Not only must the Commission review the rules of both exchanges and the terms and conditions of proposed linkages, but the Commission must also develop understandings with governments around the world regarding information sharing and other matters which would affect market oversight and enforcement actions. Unless the Commission can respond to these developments, assuring itself that the integrity of domestic exchanges is not compromised, international expansion may be inhibited.

Another area which is rapidly evolving is the increasing use of the financial futures and option markets by institutional investors. The development of new risk-shifting and investment devices are raising a wide variety of issues which the Commission must confront. While off-exchange futures and options generally are statutorily banned, the Commission is receiving numerous requests to permit such activity in some form away from exchanges, not only in the financial products area

but also the agricultural area. Unless the Commission can devote some attention to these inquiries, industry expansion may be inappropriately inhibited.

An area in which the Commission recently acted to open up a previously prohibited activity is exchange-traded options. In 1981, a three-year pilot program for nonagricultural options was developed, and the first trading under that program began in the fall of 1982. Due to a change in legislation in 1982, the 1930's ban on agricultural options was lifted, and the first options under that program have now been trading for over a year. These instruments had been banned because of the trading and sales practice abuses to which they were subject. As the Commission and the industry have gained experience under these pilot programs, a number of new oversight responsibilities have emerged -- sales practice audits, margin setting and oversight of clearinghouses. The latter two responsibilities have become apparent as a result of the fact that the risk configuration of options is considerably different from that of futures. The default of a clearing member of a New York exchange clearinghouse recently demonstrated the need to assure that the financial safeguards are commensurate with the financial risk associated with these instruments. Unless appropriate financial safety nets are in place, the effects of a default can be spread to other sectors. The developing integration of the futures markets with other financial sectors magnifies the risks of financial failure in futures markets because of the potential "ripple" effects. Nevertheless, simply prohibiting trading or program expansion to avoid that risk may deprive market participants of much needed individual risk management tools.

The Commission is challenged to keep pace with the speed and complexity of the changes affecting the futures and option markets. It must have the resources to meet these challenges or become a potential roadblock to beneficial developments due to insufficient resources. Complex developments such as those noted require study and thought by the Commission as well as action. Other changes in the technology of trading, communication and recordkeeping require the Commission to make appropriate commensurate changes to its regulations and surveillance oversight systems simply to keep pace. Action can only take place with a thorough understanding of the market and its technology, or the regulations and policy developed may result in inappropriate regulations possibly with deleterious effects on the marketplace.

At its current level of resources, the Commission will be strained in performing its mission in this complex environment. The Commission's FY 1986 budget, after cuts resulting from the Balanced Budget and Emergency Deficit Control Act of 1985, will allow the Commission to fund only 493 staff-years. In allocating its FY 1986 budget, the Commission undertook a thorough internal review of all line items in view of its goals and objectives. The Commission will continue to prioritize its work so that it can respond to a growing workload with fewer resources. However, it is likely that backlogs will occur in many areas, such as contract

market designations, and that reduced activity will result in other areas, such as enforcement actions. In addition, the Commission will have several major projects to tackle in FY 1986. The Commission's authorization expires at the end of FY 1986, so the agency will be involved in the Congressional reauthorization process for most of FY 1986. Although the Commission is hopeful that this reauthorization will not be as time-consuming as the 1982 reauthorization, it is important to note that the 1982 reauthorization took over seven staff-years, not including the time devoted to the effort by the senior staff and by the offices of the Chairman and Commissioners. In addition, the Commission will review the pilot program on options on non-agricultural futures during FY 1986.

Another major project of the Commission during FY 1986 will be implementation of the audit trail rules. The Commission published these rules on December 27, 1984, seeking comment on ways to improve exchange audit trails for market surveillance and enforcement purposes. The Commission received 58 comment letters from a variety of interested parties including farm organizations, exchanges and public users of the markets. The rules, which require each contract market to meet a performance standard for recording the time of trades in increments of no more than one minute intervals, were adopted unanimously by the Commission on January 14, 1986, and published in final in the Federal Register on January 21, 1986. Exchanges are now in the process of developing plans for implementation of the new standard, which must be in place by October 1, 1986. These rules, which will facilitate more accurate and timely reconstruction of trades, reflect the Commission's continuing emphasis on self-regulation in this era of advancing technology.

In formulating its FY 1987 budget submission, the Commission made several important assumptions. First, the Commission assumed that the 1986 reauthorization will not change the basic mission of the agency and that no significant new responsibilities will be added by Congress as a result of reauthorization. In addition, the Commission assumed that the industry projection is correct that growth will continue as it has over the last five years. And, finally, the assumption was made for budget planning purposes that the Commission would not be responsible for regulating new products and new entrants into the leverage business. It should be noted that the Commission is seeking to remove leverage from its jurisdiction in reauthorization legislation. If any of these assumptions prove incorrect and thereby increase the agency's responsibility, the Commission may need to seek additional funding.

The increase of 15 staff-years requested for FY 1987 is designed to allow the Commission to focus on its long-range goals and objectives. The FY 1987 request supports the goals and objectives cited in Exhibit 1 as follows:

GOAL: TO FOCUS THE COMMISSION'S RESOURCES ON SURVEILLANCE, OVERSIGHT AND ENFORCEMENT AND TO STRENGTHEN SELF-REGULATION.

Enforcement -- Eight new staff-years are requested to allow the Commission to respond to basic enforcement needs and to focus on areas of particular concern: commodity pool fraud, fraud committed by futures commission merchants, investigation and litigation of trade practice violations and manipulation cases, assistance to the states in prosecuting off-exchange fraud cases, and enforcement of compliance with Commission orders. Enforcement is one of the activities of the Commission which cannot be delegated to the self-regulatory organizations. The need for enforcement grows as the variety of instruments, volume of trading and number of market participants grows. The Commission must have sufficient staff to maintain an enforcement presence, i.e., to have a deterrent effect, throughout the industry and the country. To the extent the Enforcement Division can successfully deter illegal behavior, the Commission's other oversight programs are supported and enhanced. Because successful enforcement activity is central to all programs of the Commission and that responsibility cannot be delegated to self-regulatory organizations, the request for additional enforcement support is proportionately larger, but no more or less important than the requests in other areas.

Market Surveillance, Analysis and Research - One staff-year is requested to handle continuing growth in the number of contracts and trading volume in futures and option markets. In addition, one staff-year is requested to enhance the ability of the Market Analysis subprogram to review economically significant rule changes and applications for designation as a contract market within statutory time limitations.

Registration, Audits and Contract Markets -- Two staff-years are requested for the Contract Markets subprogram to handle rule enforcement reviews, targeted oversight reviews and on-site reviews of exchanges and the National Futures Association (NFA). These reviews are the cornerstones of the Commission's trade practice oversight program. These staff-years will support review of new exchanges, international linkages and clearing organization functions.

No new staff-years are requested for the audit subprograms or the Registration subprogram. The staff levels in these areas will be able to remain the same or decrease in FY 1986 due to NFA's assumption of many CFTC audit and registration responsibilities.

Legal Counsel -- The one additional staff-year requested would be devoted to keeping pace with the volume of Commission orders and opinions by which the Commission decides issues set before it, in order to avoid a recurrence of the severe case backlog that the Legal Counsel substantially reduced in FY 1985.

Administrative Support Services -- One staff year is requested for the Library in order to restore the interlibrary loan and research assistance functions of the Library, which support all of the Commission's programs, but particularly the enforcement program.

GOAL: TO ANTICIPATE, UNDERSTAND AND RESPOND TO DEVELOPMENTS IN THE FUTURES AND RELATED MARKETS.

Although no additional staff-years are specifically requested to achieve this goal in FY 1987, the requests related to other goals are crucial to accomplishing this goal as well. When the staff of the Commission is so small that it is pressed to keep pace with its most essential tasks, any change in the markets which must be responded to quickly is seriously disruptive to the Commission's operations. With additional staff, the Commission can respond to, for example, emergency oversight activities such as those involving Volume Investors on the Comex, with less sacrifice to the timing of completion of other routine mandatory functions, some of which involve approval of new products or necessary product improvements.

GOAL: TO PLAN FOR SUFFICIENT HUMAN AND FINANCIAL RESOURCES AND MANAGE THEM EFFECTIVELY.

Administrative Support Services - One program analyst is requested for the Audit and Evaluation Section to provide for reviews of Commission program activities and implementation of OMB Circulars A-123 and 127, which deal with effective internal controls and financial management systems.

Conclusion

In order to accomplish these goals and to address the workload projected for FY 1987, the Commodity Futures Trading Commission requests a budget of $30,418,000 for fiscal year 1987 to fully fund 508 staff-years. This increase of $2,435,000 over the FY 1986 budget covers the costs associated with increased operating expenses and the 15 additional staff-years requested. During FY 1987, the Commission expects to collect about $1 million in service fees.

In summary, the Commission's FY 1987 budget request of $30,418,000 is the minimum necessary to allow the Commission to meet its goals. It is important to note that the Commission has made every attempt to streamline its operations and to eliminate unnecessary programs. The Commission takes pride in its ability to accomplish a great deal with few resources, notwithstanding substantial growth in the futures industry, and expects to continue to make great strides in FY 1987 at the requested level.

EXHIBIT 1

GOAL: To focus the Commission's resources on surveillance, oversight and enforcement and to strengthen self-regulation.

OBJECTIVES:

To conduct effective market surveillance to ensure the integrity of the marketplace for hedging and price discovery.
To conduct strong rule enforcement oversight.
To strengthen enforcement programs at both the Commission and in self-regulatory organizations.
To improve exchange audit trails.
To increase automation of data for surveillance, oversight and enforcement.
To improve coordination among regulators, including federal agencies, states and self-regulators.
To strengthen self-regulatory organizations' responsiveness to identified regulatory concerns.
To incorporate customer protection issues into regulatory and self-regulatory programs in areas such as protection of customers' funds, execution of orders, and oversight of commodity sales practices.
To require quality rule and contract submissions.

GOAL: To anticipate, understand and respond to developments in the futures and related financial markets.

OBJECTIVES: Anticipate, understand and respond to developments including those related to:

Risks to financial and market integrity.
Changes in self-regulatory organizations and in the registrant base.
New users and uses of the markets.
New products and contract specifications.
Advances in technology and trading techniques.
Internationalization of the markets.
Off-exchange transactions.
Changes initiated by other federal agencies affecting futures markets.
Evolution and condition of the underlying cash markets.

GOAL: To plan for sufficient human and financial resources and manage them effectively.

OBJECTIVES:

To target areas for regulatory emphasis and de-emphasis.
To utilize the planning process to identify priority programs and activities and to allocate resources accordingly.
To identify, attract and retain qualified personnel.
To develop ADP systems to enhance and streamline operations.
To reduce paperwork Commission-wide.

BIOGRAPHICAL INFORMATION -- CFTC COMMISSIONERS

Chairman Susan M. Phillips

President Reagan renominated Dr. Susan M. Phillips to continue as CFTC Chairman when her initial term as Commissioner expired in April 1985. She was confirmed by the Senate and was sworn in as Chairman on October 23, 1985 by Supreme Court Justice Sandra Day O'Connor, having been sworn in as Commissioner the previous day by fellow Commissioner Kalo Hineman.

A CFTC Commissioner since November 1981, Dr. Phillips was appointed Acting Commission Chairman to replace retiring Chairman Philip McBride Johnson on May 2, 1983. She was sworn in as Commission Chairman on November 17, 1983.

Dr. Phillips left the position of associate vice president of finance and university services at the . versity of Iowa, where she had also served on the finance faculty, to join the Commission. She has been an economic policy fellow at the Brookings Institution.

Dr. Phillips earned a B.A. degree in mathematics and economics from Agnes Scott College in 1967; an M.S. in finance and economics in 1971 and a Ph.D. in finance in 1973 from Louisiana State University. Dr. Phillips also was initiated into Beta Gamma Sigma at Louisiana State University and Phi Beta Kappa at Agnes Scott College. Her areas of specialization as an economist, in addition to options and commodity futures, include financial management and the economic theory of regulation. She is the author of numerous articles as well as coauthor, with J. Richard Zecher, of The SEC and the Public Interest, which was published by MIT Press.

Commissioner Kalo A. Hineman

Kalo A. Hineman was nominated as a Commissioner of the Commodity Futures Trading Commission by President Ronald Reagan on December 10, 1981, and formally sworn in on January 12, 1982, for a term expiring June 19, 1986.

Since 1947, Mr. Hineman has been a cattleman, rancher, wheat and milo farmer in Dighton, Kansas. He is co-owner with his son of Kalo Hineman Cattle Company and Hineman Partners, a farming company. From 1955 to December 1981, he was a Director of First National Bank of Dighton; and from 1974 to December 1981, he was a member of the Kansas House of Representatives.

Commissioner Hineman is a member of the Kansas Livestock Association (President, 1972), the National Cattlemen's Association (Member, Board of Directors, 19711972), American Farm Bureau Federation, and the National Association of Wheat Growers.

Commissioner Hineman is a 1943 graduate of Kansas State University where he received his D.V.M. He served in the United States Army, Veterinary Corps, as a Captain in 1943-1946. From March to October 1945, he also served with the Office of Strategic Services (OSS).

Commissioner Hineman is married, has four children, and resides in Alexandria, Virginia.

Commissioner Fowler C. West

Fowler C. West was sworn in as a Commissioner of the Commodity Futures Trading Commission on October 6, 1982, for a term expiring April 1987.

Since 1963, Mr. West worked on Capitol Hill, both in the Office of Congressman W. R. Poage (D-Tex.) and on the House Committee on Agriculture. He served as Staff Director of that Committee from 1973 to 1982.

Commissioner West was President of the Congressional Staff Club (1974) and received the Congressional Staffer of the Year Award for 1977. He currently serves on the Advisory Committee on CFTC/State Cooperation at the CFTC. Commissioner West also serves as CFTC-Designate to the U. S. Office of Consumer Affairs Consumer Advisory Council and is a member of the National Futures Association Consumer Advisory Council.

Commissioner West, who was near Waco, Texas, received his B.A. in political science and history from Baylor University in 1963. He also holds an M.A. in legislative affairs from George Washington University (1980).

Commissioner West, his wife, the former Anne Smith Paine, and their three sons, Fowler Jr., Mitchell and William, live in Alexandria, Virginia.

Commissioner William E. Seale

William E. Seale, nominated by President Reagan for a term expiring April 15, 1988, joined the Commission on November 18, 1983.

Commissioner Seale, a former vice president of Commodity Exchange, Inc., also served as legislative assistant to U.S. Senator Walter D. Huddleston (D-Ky.) from 1975 until 1979.

Dr. Seale holds a Ph.D. in agricultural economics from the University of Kentucky, where he was a member of the faculty before relocating to Washington. He has written and spoken extensively on production economics, agricultural policy and futures and options trading.

Commissioner Robert R. Davis

Robert R. Davis was nominated by President Reagan and confirmed by the Senate to serve as a CFTC Commissioner for a term expiring on April 13, 1989. He took the oath of office in October 1984.

Commissioner Davis attended Virginia Polytechnic Institute, where he received a B.A., M.A. and Ph.D. degrees in economics. He served on the economics faculty at Vanderbilt University in 1975 and 1976, and subsequently joined the Federal Deposit Insurance Corporation as Financial Economist.

Commissioner Davis left Washington in 1979 for five years to serve as Vice President and Economist at the Harris Bank in Chicago. Prior to joining the Commission, he served as Senior Economist for the Joint Economic Committee of the United States Congress.

Commissioner Davis has authored numerous articles in economics and finance. He remains active in the academic arena, and presently serves in absentee roles as Special Lecturer at Virginia Polytechnic Intitute and Distinguished Research Scholar at Mississippi State University.

The History of the Fiscal Year 1987 Budget Request

In August 1985, the Commission voted to request $34,221,000 for FY 1987 to fund a total of 567 staff-years and to support anticipated increases in operating expenses. After submitting this budget request concurrently to the Office of Management and Budget (OMB) and the Congress on August 30, 1985, the Commission staff participated in an informal budget hearing on September 26, 1985, with staff members of OMB.

On December 12, 1985, OMB approved an FY 1987 budget of $30,418,000 which will fund a staff-year level of 508. These explanatory notes reflect the FY 1987 budget request recommended by the President.

EXECUTIVE LEVEL POSITIONS
(As of January 21, 1986)

POSITION	SALARY	GRADE
EXECUTIVE LEVEL:		
Chairman	$73,600	EX 3
Commissioner	72,300	EX 4
Commissioner	72,300	EX 4
Commissioner	72,300	EX 4
Commissioner	72,300	EX 4
SENIOR EXECUTIVE LEVEL:		
Executive Director	$72,300	ES 6
Deputy Executive Director	72,300	ES 6
General Counsel	72,300	ES 6
Deputy General Counsel (Regulation & Administration)	68,700	ES 4
Deputy General Counsel	72,300	ES 6
Deputy General Counsel (Litigation)	68,700	ES 4
Associate General Counsel (Opinions & Review)	70,500	ES 5
Director, Division of Enforcement	70,500	ES 5
Deputy Director, Division of Enforcement (Eastern Operations)	66,232	ES 3
Deputy Director, Division of Enforcement (Manipulation & Special Operations)	Vacant	
Deputy Director, Division of Enforcement (Western Operations)	66,232	ES 3
Director, Division of Trading and Markets	72,300	ES 6
Deputy Director, Division of Trading and Markets (Contract Markets)	66,232	ES 3
Chief Counsel, Division of Trading and Markets	66,232	ES 3
Chief Economist, Division of Economic Analysis	70,500	ES 5
Deputy Chief Economist, Div. of Economic Analysis	72,300	ES 6
Chief, Analysis Section, Div. of Economic Analysis	70,500	ES 5
Assoc. Dir. for Surveillance, Economic Analysis	68,700	ES 4

SUMMARY OF INCREASES AND DECREASES

Program	Fiscal Year 1985 Actual Staff Years	Fiscal Year 1985 Actual Amount ($000)	Fiscal Year 1986 Pre G-R-H Estimate Staff Years	Fiscal Year 1986 Pre G-R-H Estimate Amount ($000)	G-R-H Reduction Amount ($000)	Fiscal Year 1986 Post G-R-H Estimate Staff Years	Fiscal Year 1986 Post G-R-H Estimate Amount ($000)	Funds Needed to Support FY 1987 Authorized S/Y Amount ($000)	Fiscal Year 1987 Request Staff Years	Fiscal Year 1987 Request Amount ($000)
Market Surveillance, Analysis & Research										
Market Surveillance	67	$ 3,000	68	$ 3,247	$ - 155	67	$ 3,092	$ + 216	68	$ 3,308
Market Analysis	18	850	19	984	- 71	18	913	+ 70	19	983
Market Research	12	547	12	642	- 23	12	619	+ 33	12	652
Allocated Direction/Support	42	2,687	42	2,833	- 102	42	2,731	+ 330	42	3,061
Total Program	139	$ 7,084	141	$ 7,706	$ - 351	139	$ 7,355	$ + 649	141	$ 8,004
Enforcement										
Enforcement	125	$ 6,717	131	$ 7,500	$ - 477	123	$ 7,023	$ + 637	131	$ 7,660
Allocated Direction/Support	55	3,464	56	3,543	- 107	53	3,436	+ 28	56	3,719
Total Program	180	$10,181	187	$11,043	$ - 584	176	$10,459	$ + 95	187	$11,379
Registration, Audits & Contract Markets										
Contract Markets & Registered Futures Assn.	34	$ 1,650	35	$ 1,829	$ - 58	33	$ 1,771	$ + 125	35	$ 1,896
Registration	16	869	8	632	- 21	8	611	+ 25	8	636
Front Office Audit	14	636	13	697	- 23	13	674	+ 41	13	715
Audit and Financial Review	40	1,924	41	2,105	- 67	41	2,038	+ 126	41	2,164
Allocated Direction/Support	46	2,082	42	2,784	- 81	42	2,703	+ 248	42	2,951
Total Program	150	$ 7,161	139	$ 8,047	$ - 250	137	$ 7,797	$ + 665	139	$ 8,462
Proceedings										
Proceedings	30	$ 1,499	29	$ 1,607	$ - 51	29	$ 1,556	$ + 87	29	$ 1,643
Allocated Direction/Support	13	831	12	837	- 21	12	816	+ 114	12	930
Total Program	43	$ 2,330	41	$ 2,444	$ - 72	42	$ 2,372	$ + 201	41	$ 2,573
TOTAL ALL PROGRAMS	512	$27,556	508	$29,240	$ -1,257	493	$27,983	$ +2,435	508	$30,418
Executive Direction and Support										
Agency Direction	36	$ 2,116	37	$ 2,329	$ - 65	37	$ 2,264	$ + 114	37	$ 2,378
Administrative Support Services	86	5,748	82	5,509	- 164	80	5,345	+ 839	82	6,184
Legal Counsel	34	1,900	33	2,158	- 82	32	2,077	+ 122	33	2,199
SUMMARY TOTAL	156	$ 9,864	152	$ 9,997	$ - 311	149	$ 9,686	$ +1,075	152	$10,761

COMMODITY FUTURES TRADING COMMISSION

OBJECT CLASSIFICATION
(Thousands of Dollars)

Identification Code: 95-1400-0-1-376	FY 1985 Actual	FY 1986 Estimate (Pre G-R-H)	FY 1986 Estimate (Post G-R-H)	FY 1987 Estimate
Direct Obligations:				
Personnel Compensation				
11.1 Full-Time Permanent	$16,931	$17,651	$17,324	$17,869
11.3 Other Than Permanent	293	281	281	281
11.5 Other Personnel Compensation	375	420	420	420
11.8 Special Personnel Services Payments	3	8	8	8
11.9 Total Personnel Compensation	17,602	18,360	18,033	18,578
12.1 Personnel Benefits: Civilian	1,961	2,184	2,146	2,242
13.0 Benefits for Former Personnel	60	—	—	—
21.0 Travel and Transportation of Persons	481	644	644	644
22.0 Transportation of Things	14	15	12	15
23.2 Rental Payments to Others	2,961	2,970	2,970	4,099
23.3 Communications Utilities and Miscellaneous Charges	1,409	1,837	1,837	2,062
24.0 Printing and Reproduction	219	301	291	303
25.0 Other Services	1,889	1,945	1,497	1,675
26.0 Supplies and Materials	396	393	373	395
31.0 Equipment	564	591	180	405
42.0 Payment Under Equal Access to Justice Act	—	—	—	—
99.0 Subtotal, Direct Obligations	27,556	29,240	27,983	30,418
99.0 Reimbursable	1	20	20	20
99.9 Total Obligations	$27,557	$29,260	$28,003	$30,438

DETAILED STATEMENT OF OBLIGATIONS AND EMPLOYMENT BY GEOGRAPHIC LOCATION
(Amounts in Thousands)

AGENCY: COMMODITY FUTURES TRADING COMMISSION

APPROPRIATION: Salaries and Expenses

LOCATION OF OBLIGATIONS:

	FY 1985 Actual	FY 1986 Estimate (Pre G-R-H)	FY 1986 Estimate (Post G-R-H)	FY 1987 Estimate
CALIFORNIA	$ 545	$ 578	$ 554	$ 672
DISTRICT OF COLUMBIA	18,418	19,544	18,703	20,296
ILLINOIS	4,607	4,888	4,678	5,050
MINNESOTA	93	99	95	103
MISSOURI	427	453	433	471
NEW YORK	3,466	3,678	3,520	3,826
Total Direct Obligations	$27,556	$29,240	$27,983	$30,418

LOCATION OF EMPLOYMENT (STAFF-YRS):

CALIFORNIA	10	10	10	12
DISTRICT OF COLUMBIA	313	311	301	310
ILLINOIS	103	102	99	101
MINNESOTA	2	2	2	2
MISSOURI	10	10	10	10
NEW YORK	74	73	71	73
Total Staff-Years	512	508	493	508

MAJOR ACTIVITIES OF CFTC OFFICES AND DIVISIONS

OFFICES OF THE CHAIRMAN

- Liaison with Congress, Federal agencies & foreign governments
- Public information
- Secretariat/FOIA office
- Education and publications

EXECUTIVE DIRECTOR

- Administration & resource management
- Long-range planning
- Automated data processing
- Personnel
- Budget & fiscal operations
- Procurement
- Administrative services
- Internal audit
- Proceedings in administrative law and reparations
- Library

OFFICE OF GENERAL COUNSEL

- Legal advisor to Commission
- Appellate litigation
- Amicus curiae briefs
- Bankruptcy intervention
- Draft Commission orders and opinions
- Review for legal sufficiency
- Draft regulations and legislation
- Defensive litigation
- Ethics and financial disclosure advice
- Freedom of Information Act appeals
- Legal support to operating divisions
- Statutory interpretation

ECONOMIC ANALYSIS

- Market surveillance
- Speculative limit rule enforcement
- Research and special studies
- Economic analysis of contract designations
- Economic review of changes to contract terms and conditions
- Pilot option programs
- Analysis of leverage registration applications

ENFORCEMENT

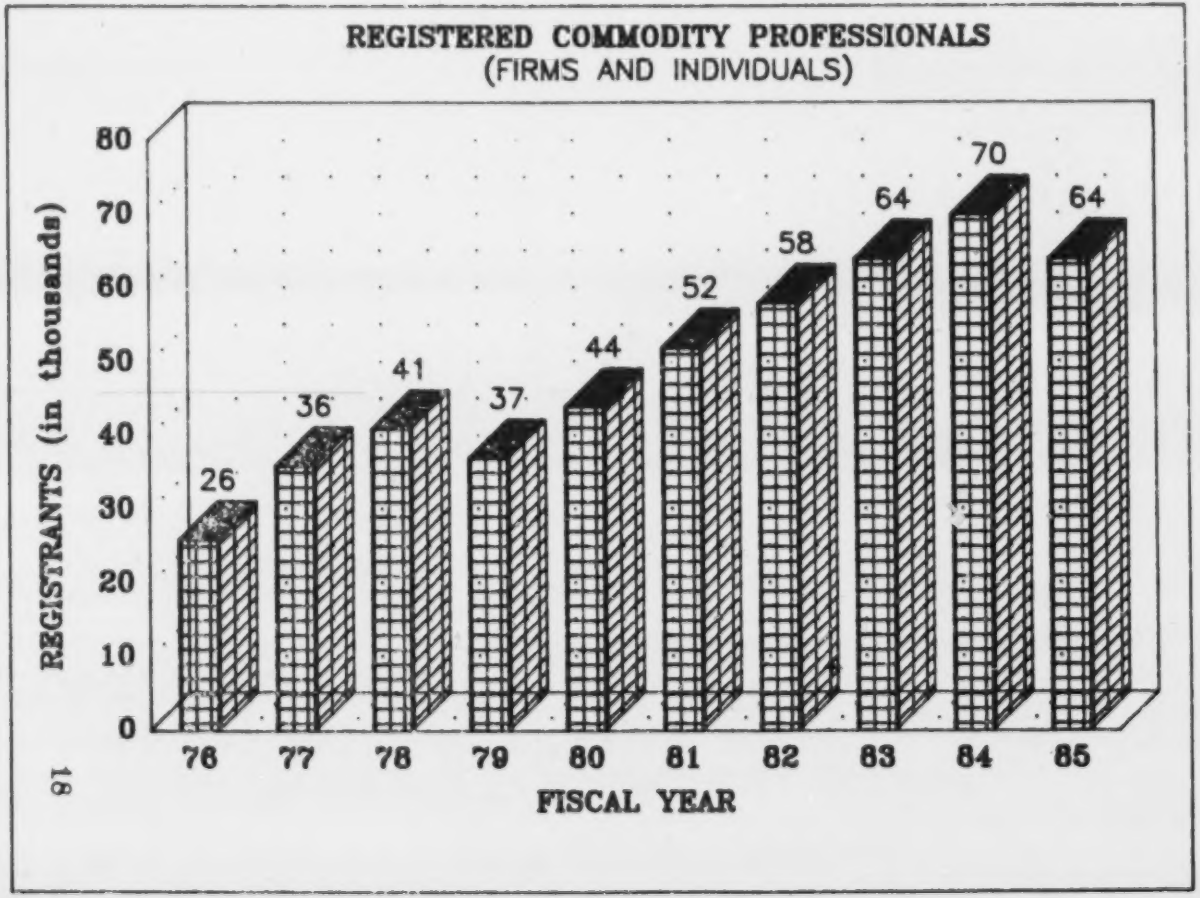
- Investigations
- Civil injunctive actions
- Administrative actions
- Criminal referrals
- Assistance to state and Federal enforcement agencies

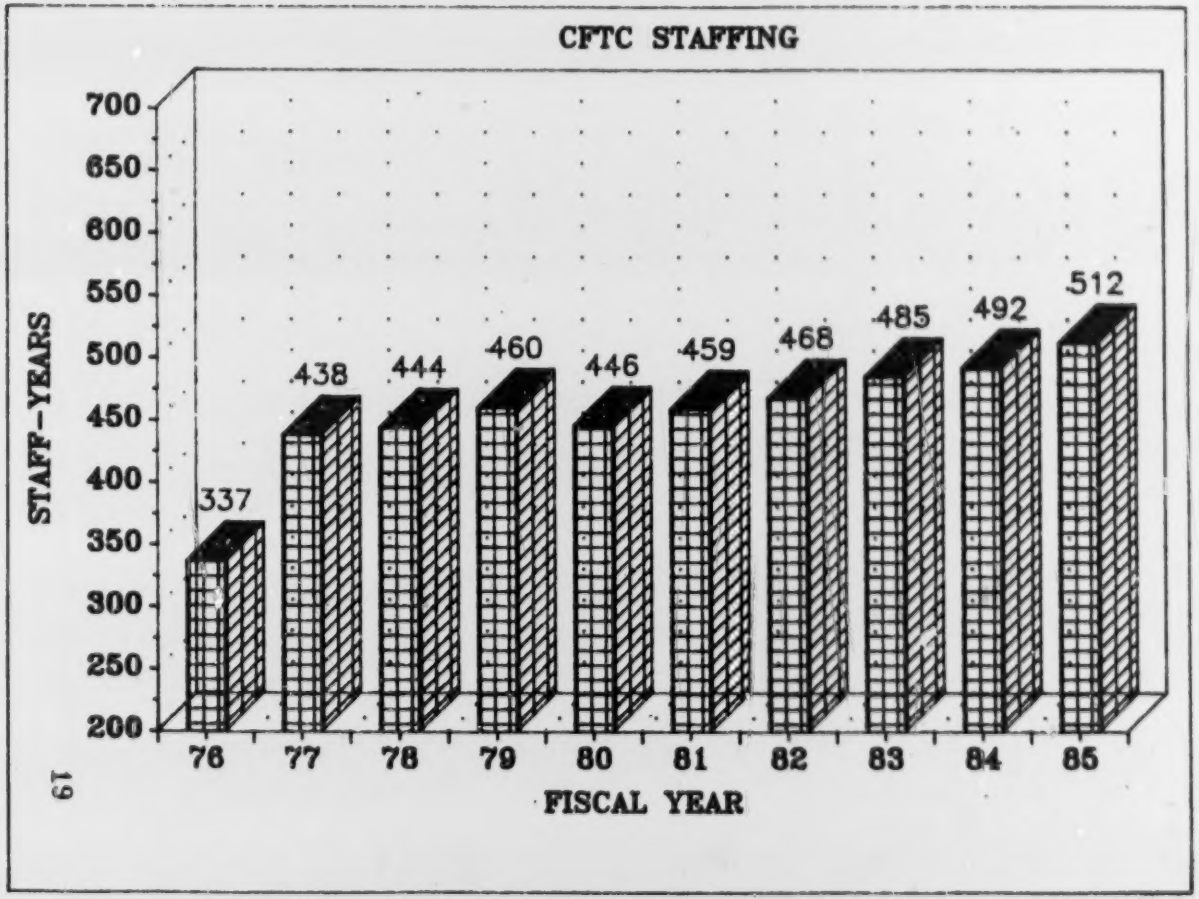
TRADING & MARKETS

- Oversight of SROs
- Investigative audits
- Rule enforcement and financial reviews
- Sales practice reviews
- Trade practice investigations
- Review of contract market designations and leverage applications
- Review of contract market rules
- Liaison with NFA
- Draft regulations
- Registration of FBs, LTMs and APs of LTMs

NUMBER OF CONTRACTS TRADED
VOLUME (in millions)
210
180
150
120
90
60
30
35
41
53
74
83
101
108
138
157
170
76
77
78
79
80
81
82
83
84
85
FISCAL YEAR

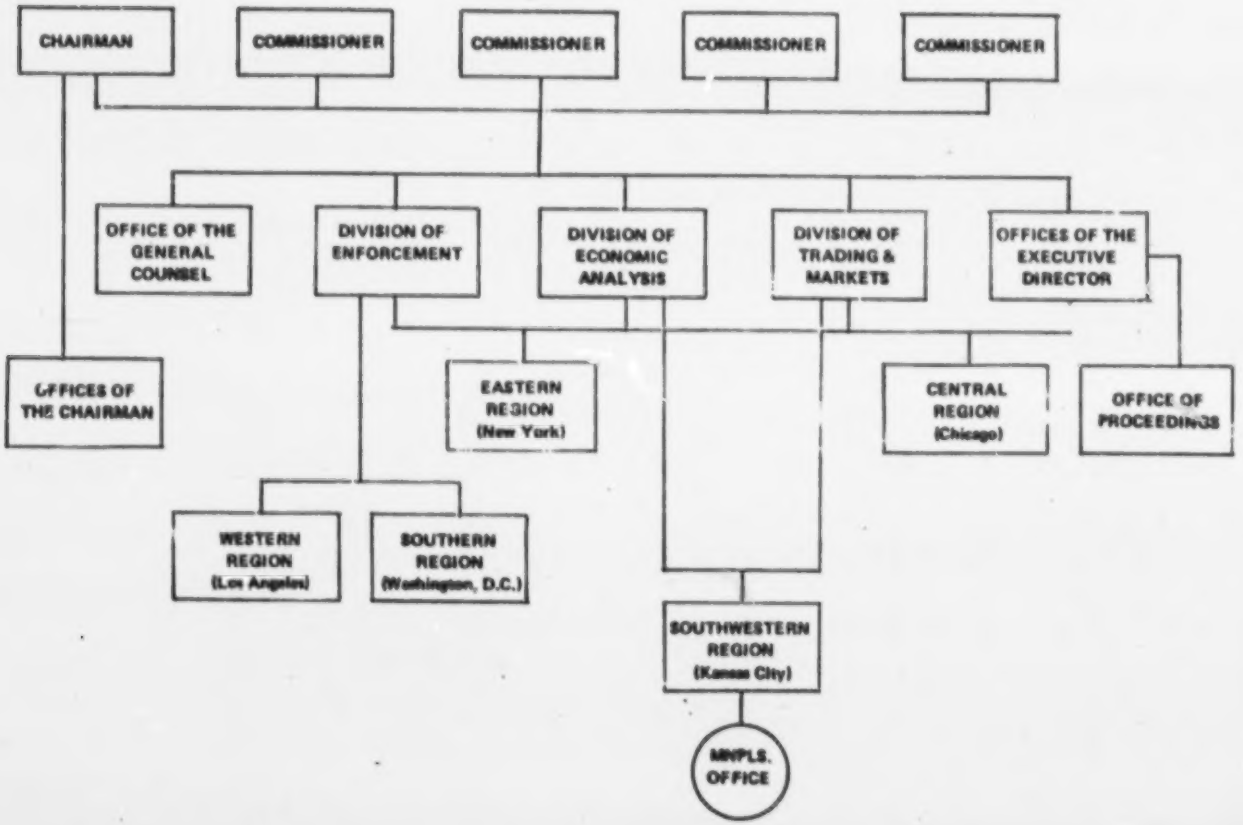
17


REGISTERED COMMODITY PROFESSIONALS
(FIRMS AND INDIVIDUALS)
REGISTRANTS (in thousands)
80
70
60
50
40
30
20
10
0
26
36
41
37
44
52
58
64
70
64
76
77
78
79
80
81
82
83
84
85
FISCAL YEAR


CFTC STAFFING
STAFF-YEARS
700
650
600
550
500
450
400
350
300
250
200
337
438
444
460
446
459
468
485
492
512
76
77
78
79
80
81
82
83
84
85
FISCAL YEAR

59-751 O—86——4

COMMODITY FUTURES TRADING COMMISSION
ORGANIZATION CHART



AGENCY DIRECTION

The Commission develops and implements agency policy. All Commission actions are directed towards (1) ensuring the integrity of the marketplace in its role as a price discovery mechanism; (2) assuring the marketplace functions efficiently, openly and competitively as a means of transferring the risk of price changes; (3) assuring the protection of customers and the financial integrity of the marketplace; (4) maximizing the effectiveness of regulation; and (5) managing the Commission's programs efficiently.

The Commission provides agency direction through quarterly reviews of program accomplishments and objectives, through public reviews of important proposals, and through daily consideration of legal, economic, and administrative issues, including reviews of appeals from opinions issued under the Proceedings Program. In addition to the Offices of the Chairman and Commissioners, the Agency Direction program includes the Secretariat, the Office of Communication and Education Services and the Office of Congressional and Governmental Affairs.

Resource Changes (FY 1987)

The Commission estimates that an increase of $114,000 is required to maintain the funded FY 1986 staffing level of the Agency Direction program in FY 1987 and provide for a share of the Commission's anticipated increase in operating expenses. Total request for FY 1987: $2,378,000.

	FY 1985 Actual	FY 1986 Estimate	FY 1987 Request
Staff-Years (FTE):			
Funded	36	37	37
Obligations (000):			
Comp/Benefits	1,680	$1,786	$1,812
Other (Direct)	57	93	103
Other (Pro rata)	379	385	463
Total	$2,116	$2,264	$2,378

Accomplishments (FY 1985)

During FY 1985, the Chairman and the Commissioners, with the assistance of their staffs, completed implementation of CFTC's new responsibilities under the Futures Trading Act of 1982. For example, the Futures Trading Act and the Commission's pilot options program provide the regulatory framework for trading options on agricultural futures contracts. On October 29, 1984, the Commission unanimously approved the trading of options on six agricultural futures contracts — live cattle, soybeans, wheat (three contract markets), and cotton. A second round of designations—corn,

live hogs and soybeans was completed in January 1985. The Commission has responded to numerous requests from farm organizations to explain the new pilot program, and has worked with the USDA Extension Service to "teach the teachers" about agricultural options and help them develop educational literature.

The Commission oversaw continued development of international futures and options trading through "linkage" agreements between futures exchanges. The first of these was the Chicago Mercantile Exchange/Singapore contract which the Commission continues to monitor. The Commodity Exchange (Comex) has applied to the Commission for approval of rule changes which would provide for linked trading with the Sydney (Australia) Futures Exchange, Ltd.

In FY 1985, the Commission licensed the first of the "grandfathered" leverage firms to do business under newly-developed leverage regulations, as provided for in the 1982 legislation.

In February of 1985, the Commission formed an Agricultural Advisory Committee made up of 21 representatives of general farm organizations, national commodity organizations, agricultural cooperatives, processing and marketing groups, and agricultural lenders. The Committee provides advice to the Commission on issues affecting producers, processors and lenders, and others interested in or affected by the agricultural commodities markets, and facilitates communications between the Commission and the diverse agricultural and agriculture-related organizations represented on the Committee. The costs of operating this Committee are negligible since all of its members have agreed to serve without per diem or reimbursement for expenses.

In June 1985, the Commission held the first meeting of its newly-constituted Financial Products Advisory Committee. The members of this advisory committee are knowledgeable concerning the activities of persons and institutions who use financial futures and options in their business activities and provided invaluable counsel and advice on CFTC regulation of this important area. The members of this Committee have also agreed to serve without per diem or other expense reimbursement.

The Commission approved two new exchanges to be contract markets--the Amex Commodities Corp. and the Philadelphia Board of Trade. The Amex, a subsidiary of the American Stock Exchange, currently is trading a gold option contract; and the PHBT, an offspring of the Philadelphia Stock Exchange, began trading an option on physical three-month Eurodollar time deposits.

On December 27, 1984, the Commission published proposed rules seeking comment on ways to improve exchange audit trails for market surveillance and enforcement purposes. The Commission received 58 comment letters from farm organizations, the exchanges, and other parties. The final rules, which require each contract market to meet a performance standard for recording the time of trades in increments of no more than one minute intervals, were approved by the Commission on January 14, 1986 and published in the Federal Register on January 21, 1986. Contract markets have until October 1, 1986 to comply with the new rules. The rules should facilitate the reconstruction of trades in a more accurate and timely manner.

The 1982 amendments to the Commodity Exchange Act significantly broadened the enforcement role of the states through the "open-season" provision which permits the application of any and all state laws to unlawful off-exchange transactions. Further, the states are now permitted under section 6d to enforce the antifraud provisions of the Act in state courts or Federal District courts. On October 19, 1984, the Commission adopted a rule which provides a procedure for states to notify the Commission of actions which they intend to bring pursuant to this section.

During FY 1985, the Commission continued to work closely with the states to encourage them to take a more active role in protecting their citizens from those who engage in unlawful conduct under commodity-related schemes. Efforts have included information sharing, cooperative enforcement actions, and providing CFTC staff support for the completion of model state legislation to give the states an additional weapon to pursue commodity fraud in their jurisdictions.

In FY 1985, the Commission made available to state and federal law enforcement agencies and others a booklet containing information regarding administrative proceedings and civil injunctive actions taken by the Commission. The Proceedings Bulletin, which will be published in the near future and updated on a periodic basis, will assist the states in identifying persons who have violated the Act.

The Commission also designated new contracts for trading, oversaw the continued development of the National Futures Association and approved a large number and variety of exchange rule amendments, as well as issuing numerous orders in reparation cases and administrative enforcement cases.

The Chairman and Commissioners are supported in the development of Agency Direction by three offices: Office of Congressional and Governmental Affairs (OCGA), Secretariat, and the Office of Communication and Education Services (OCES).

The Commission completed several studies the Congress mandated in the Futures Trading Act of 1982. OCGA assisted in the coordination of these studies with Division's within the Commission and with other federal agencies involved in writing these studies. For instance, A Study of the Effects on the Economy of Trading in Futures and Options, also known as the "Fed study" or the "interagency study," was written by the Commission, the Board of Governors of the Federal Reserve System, and the Securities and Exchange Commission.

OCGA also coordinated the completion and submission to the Congress of two other studies: A Study of the Nature, Extent and Effect of Futures Trading By Persons Possessing Material, Nonpublic Information and an Addendum to the 1984 Annual Report, Uses of Livestock Futures Markets by Large Hedgers.

OCGA also participated in meetings with officials and private individuals from nine foreign countries, discussing the role of the Commission as the chief regulator of the futures industry and the impact of the Commission's regulatory programs on international traders and organizations. These meetings

enabled the Commission to exercise better its duties with the cooperation of other foreign governments.

In the routine course of business, OCGA prepared Commission testimony to be presented to Congress, in addition to answering constituent staff inquiries from Members of Congress and their staffs.

The Office of the Secretariat continues to provide essential administrative support to the Chairman, Commissioners, and other staff offices. Meeting this responsibility involves many functions such as maintaining official agency records, scheduling Commission meetings, responding to FOI, Privacy and Sunshine Act requests and providing information to the public and CFTC staff. These functions are performed by the Secretariat's administrative staff, the records section, and the FOI, Privacy, and Government in the Sunshine Act compliance staff.

In addition to its tasks of records maintenance, the Records Section, staffed by only one employee, handles several thousand inquiries annually from both the Commission staff and the general public concerning information contained in the official records. The three members of FOIA Compliance staff received and processed approximately 515 requests for nonpublic Commission records in FY 1985.

In addition to its routine tasks, functions, and activities, in FY 1985 the Secretariat Staff undertook several special projects. A program to convert all the records systems in the office to microfilm was begun. The conversion will continue into FY 1986 and FY 1987 with periodic updates to follow to maintain the format and integrity of the records. However, due to a reduction in the staffing level of the records section, the microfilm project will not be completed in the original time frame. In FY 1985, the staff worked jointly with staff of the Office of General Counsel in reviewing the Commission's regulations and procedures addressing the methods for handling petitions for confidential treatment and FOIA requests. As a result of this review, proposed amendments to existing Commission regulations were published in the Federal Register.

The Office of Communication and Education Services serves as a liaison with the news media, producer and market user groups and the general public to inform them about the role of futures markets, new market instruments, market regulation, and the functions of the Commission.

During FY 1985, OCES continued to improve and expand working relationships with the media covering the commodity futures industry by regularly servicing 250 reporters through approximately 250 press releases and advisories and through several press briefings, augmented by "backgrounders" on technical issues. OCES also published and distributed each week 1,000 copies of the Advisory Calendar, which reports the official Commission activities. During the year, OCES revised several brochures about the Commission's regulatory programs and basic facts about futures markets, and then distributed approximately 90,000 copies. Other OCES activities included publishing and distributing information materials to agriculturally-oriented groups and the university and education communities.

In conjunction with the National Futures Association, OCES took a more active role in providing information about off-exchange commodity fraud to consumers through organizations like the Better Business Bureau, the National Association of Retired Persons and the President's Consumer Affairs Council. Commissioners, OCES, and NFA participated in National Consumers' Week, a consumer education project sponsored by the President's Consumer Affairs Council.

As part of a new internal training program for new CFTC employees about the purpose and function of futures markets, and the organization and activities of the Commission, OCES also developed an audio visual tape library which includes 25 tapes and films about the industry. OCES also published a compilation of daily newsclips relevant to the Commission's regulatory responsibilities. The newsclips reflect 40 periodicals, including 14 dailies and 20 weeklies.

Special OCES projects in FY 1985 included publishing a special 10-year history of the Commission to commemorate the CFTC's 10th Anniversary and organizing an issues conference for over 400 participants.

Planned Activities (FY 1986)

The Congress will consider in FY 1986 legislation reauthorizing the expenditure of funds by the agency. The Commission may be required to spend considerable time and effort in providing information to the Congress and to the Administration on issues involved in the reauthorization process. This resource commitment will involve all of the Commissioners and their staffs as well as the Offices of the Chairman, including the Secretariat, Communications and Education Services and Congressional and Governmental Affairs.

During FY 1986, the Commission expects to oversee the self-regulatory functions performed by exchanges and the National Futures Association (NFA). In January, the Commission submitted to Congress a report on the development of NFA as a self-regulatory agency. In addition, the Commission expects to continue to consider new and innovative contract market designations, including issues involving computerized trading and international linkages. The Commission will continue its Advisory Committee on State-Federal Cooperation and increase generally its efforts to encourage the states to get involved in the prosecution of fraudulent commodity activities wherever jurisdictionally appropriate. The agency will also continue its Agricultural Advisory Committee, which advises the Commission on a broad range of agricultural issues, as well as its Financial Products Advisory Committee. The Commission will also complete its evaluation of the non-agricultural options pilot program and determine whether to continue the pilot status or otherwise allow trading of options under such conditions as may be appropriate.

The Office of Congressional and Governmental Affairs (OCGA) will continue to encourage growth in the relationship between the Commission and the states and other federal agencies, particularly in the areas of information sharing, joint surveillance, and enforcement efforts.

The Secretariat plans to continue providing administrative support to the Commission, as well as performing the activities of records management and processing of FOIA requests. In addition, the Secretariat will continue to convert the official Commission records to microfilm.

During FY 1986, OCES will continue to provide education seminars and information. In addition, OCES will continue to develop resource files on economic and legal subject areas and develop its local, and especially rural, media contacts to improve the level of understanding among local press.

OCES will continue: (1) to provide information to the media especially through daily and weekly publications, (2) to provide internal training to CFTC staff, (3) to try to meet the substantially increased information needs of the Commission during reauthorization.

Planned Activities at Current Level (FY 1987)

During FY 1987, the Offices of the Chairman and Commissioners will continue to perform all of their review and oversight responsibilities over a continually expanding industry. The Commission's three Advisory Committees will continue to provide valuable input and OCGA will work to continue the progress in federal/state relations in matters affecting the futures industry. Priority will be placed on providing public information and meeting the internal training needs of the Commission.

ENFORCEMENT

The Enforcement Program investigates and prosecutes violations of the Commodity Exchange Act and Commission regulations.

A strong Enforcement Program is essential to protect the futures and option markets' economic functions and the monies and properties of the market users. The Enforcement Program must also support the Commission's oversight of self-regulation by insuring swift and appropriate enforcement action against wrongdoers. To the extent that the Commission cannot respond to and act on referrals from other CFTC Divisions with self-regulatory oversight responsibility or the self-regulatory organizations themselves, the effectiveness of self-regulation is significantly weakened. Enforcement is an area that cannot be replaced by self-regulation; indeed Enforcement must act to complement and assure the effectiveness of self-regulation.

The Commission has numerous tools, including broad investigative powers, civil injunctive actions and criminal referrals. Referrals from other CFTC program areas, public inquiries, other federal and state agencies and self-regulatory bodies all serve as investigation sources.

CFTC enforcement actions cover diverse and complex areas, including:

- Manipulation, cheating and defrauding of customers by commodity professionals;
- Wash trades, cross trades, accommodation trades and prearranged trading;
- Fictitious trading or trading at other than bona fide prices;
- Misappropriation of customer funds;
- Sales of illegal instruments;
- Violations of reporting or recordkeeping requirements;
- Violations of customer protection rules;
- Violations of financial integrity regulations;
- Misrepresentations by commodity pool operators (CPOs) and commodity trading advisors (CTAs) of trading results, of the way in which funds will be used or of commission or fee arrangements;
- Violations of speculative position limits.

The staff also investigates and prosecutes cases involving persons who appear to be unfit for registration with the Commission. The complexity of most CFTC enforcement actions results in protracted and difficult litigation which is resource-intensive.

Prompt and diligent prosecutions protect the legitimate hedging and pricing functions of futures markets from the economic inefficiencies and lessening of integrity created by unlawful practices. Prosecutions also restrain and deter persons who would victimize customers by means of fraudulent and deceitful practices, thereby strengthening investor confidence in the utility of futures and other related markets.

Enforcement also works with other federal and state law enforcement officials to educate and assist them in commodities related cases brought nationwide to halt illegal activities with a commodities theme.

Unlike many of the Commission's other program areas, Enforcement's responsibilities cannot be shared or effectively delegated to industry self-regulators, including the exchanges and the National Futures Association ("NFA"). Self-regulatory organizations only have jurisdiction over their own members and, in the case of exchanges, over activities occurring on that exchange. In addition, self-regulators' penalties may not be sufficient to deter potential violators. Self-regulators cannot, for instance, seek civil injunctive remedies, suspend all trading privileges, freeze assets and seek disgorgement.

Similarly, automation does not provide efficiencies to Enforcement as it does to other program areas. Automation can assist Enforcement in assembling and analyzing data, particularly in large complicated cases, but it cannot be substituted for the necessary records review, analysis and investigative testimony needed to bring a case. Each case brings a new set of circumstances, data to be analyzed and documents to be prepared, making enforcement investigation and litigation necessarily labor intensive.

The Enforcement Program must be responsive to developments in the markets. When the Commission becomes aware of an FCM or pool operator who appears to be in financial difficulty, the enforcement staff must be prepared to assemble a team and move quickly (within hours) to preserve the remaining assets of the firm. The same is true in a market liquidation if a trader or group of traders is threatening to disturb the market. In such cases, enforcement staff must be prepared to act immediately. These diversions of resources can cause other ongoing activities to be delayed. In some cases, the delay may not be a serious problem, but in others, the effectiveness of enforcement efforts may be impaired.

Resource Changes (FY 1987)

The Commission estimates that an increase of $637,000 is required for the Enforcement Program in FY 1987. The increase includes the costs related to eight additional staff-years and a share of the Commission's anticipated increase in operating expenses for FY 1987. Total request for FY 1987: $7,660,000.

	FY 1985 Actual	FY 1986 Estimate	FY 1987 Request
Staff-Years (FTE):			
Funded	125	123	131
Obligations (000):			
Comp/Benefits	$4,886	$5,018	$5,294
Other (Direct)	517	734	853
Other (Pro rata)	1,314	1,271	1,513
Total	$6,717	$7,023	$7,660

Accomplishments (FY 1985)

During FY 1985, the Division opened 138 new investigations, in addition to a workload of 126 investigations pending at the beginning of the fiscal year, and closed 125 investigations. Approximately two-thirds of the operational staff-hours of the Division were devoted to investigations and one-third were devoted to litigation and cooperative enforcement matters. During FY 1985, the Commission filed 18 civil injunctive actions, 51 administrative Enforcement proceedings, 14 statutory disqualification proceedings, five civil contempt proceedings and one subpoena enforcement action. The staff added these cases to its existing workload of 131 cases pending at the beginning of the fiscal year. Seventy-seven cases were completed during FY 1985.

Civil Injunctive Actions: The civil injunctive actions brought and injunctive relief ordered during FY 1985 in the federal district courts include:

— Financial Integrity

- An injunctive action filed and a receiver appointed in less than 24 hours of the Division's learning that a clearing-member FCM had insufficient segregated funds and could not demonstrate compliance with the Commission's minimum financial requirements. As a result of this action, more than $7.6 million of customer funds were transferred to the control of the receiver.

— CPO Fraud

- Two cooperative injunctive actions with the Securities and Exchange Commission as co-plaintiff against unregistered commodity pool operators charged with defrauding approximately 1100 investors out of in excess of $58 million.

-- FCM Fraud

° An injunctive action against an FCM and three of its officers and principals alleging churning of customer accounts, unauthorized trading and unauthorized sales practices.

In addition, the defendant in one of the Commission's first criminal contempt cases was sentenced to 120 days in prison.

Administrative Proceedings: In the administrative forum, the Commission's FY 1985 cases include:

— Price Manipulation

° A case charging five futures traders, a floor broker and an FCM with manipulation of the price of silver and silver futures from September 1979 through mid-March 1980.

— Oversight of Self-Regulatory Organizations

° Two cases charging two commodity exchanges with failure to enforce their rules and failure to maintain continuing affirmative action programs to secure compliance with the Act and their rules. Both exchanges were ordered to cease and desist from future violations of this nature and to pay civil penalties of $70,000 and $60,000 respectively.

° A case against an FCM, its two principals, an exchange, the exchange clearing corporation and three floor traders arising from the default of an FCM.

— Commodity Reporting

° Sanctions imposed in four cases charging foreign futures traders with failing to provide required information to the Commission. A total of $230,000 in civil penalties and trading prohibitions, ranging from eight months to a permanent ban, were imposed.

° A case charging an FCM with reporting violations was resolved with the FCM paying no civil penalties, but undertaking to install a new computerized reporting system.

— Speculative Limits

° A case charging repeated violations of speculative limits was settled with payment of a $425,000 civil penalty and imposition of a cease and desist order.

— FCM Fraud

A case charging an FCM and three of its officers with fraud and failure to supervise in connection with alleged trading of customer accounts for the purpose of generating commissions without regard for the investment or trading objectives of the customers.

-- Trade Practice

- A case charging wash sales and spurious exchanges of futures for physicals was settled with payment of $100,000 in civil penalties and imposition of a cease and desist order.

- A case charging an FCM, three of its officers and four floor traders with wash sales, non-competitive trading and violations of the Commission's reporting, recordkeeping and registration requirements.

Relief Obtained: In administrative proceedings completed during the first nine months of the fiscal year, $1,860,600 was imposed in civil penalty assessments. Sanctions and other relief obtained in civil injunctive and administrative cases were as follows:

• Emergency orders freezing assets or preserving records:	9
• Persons preliminarily enjoined:	25
• Persons permanently enjoined:	77
• Persons against whom cease and desist orders were entered:	101
• Persons whose registrations were either suspended, denied or revoked:	53
• Persons prohibited from trading:	54
• Persons against whom civil contempt orders were entered:	1
• Persons against whom jail sentences were imposed pursuant to findings of criminal contempt:	1
• Number of persons subject to civil penalty assessment:	86
• Dollar amount of civil penalty assessments:	$2,788,600

In addition, as a result of the Commission's civil injunctive actions, over $14 million in customer funds and other assets were placed under the protection of eleven receivers obtained by the Division for eventual distribution to customers.

Assistance in Criminal Actions: In addition to bringing civil and administrative proceedings on behalf of the Commission, the enforcement staff provided investigative and technical support to United States Attorneys' offices and state prosecutors for the investigation and prosecution of criminal violations of the Commodity Exchange Act (CEA) and other statutes in the following significant cases:

- Sentencing of a principal of an FCM to six months' imprisonment, five years probation, fine of $5,000, and payment of $200,000 to the trustee in bankruptcy to satisfy commodity customer losses, which exceeded $1.5 million, based upon a conviction of embezzlement in violation of Section 9(a) of the Act and of false statements to the Commission, in violation of the Act.

- Indictment of 10 individuals by the State of New York for conspiracy, scheme to defraud, grand larceny, operating a bucket shop, and fraud in the sale of securities and commodities, in connection with a fraudulent off-exchange futures scheme.

- Federal indictments of five individuals for conspiracy, mail fraud and wire fraud, in connection with a fraudulent off-exchange futures scheme involving $5.8 million of customer funds.

- Sentencing scheduled for September 1985 of a commodity pool operator who pled guilty to four counts of a 120 count indictment charging him with 100 counts of mail fraud and 20 counts of fraud in violation of the Act, in a scheme where nearly 800 investors were defrauded of $16.4 million.

- Criminal trial in Memphis, Tennessee, regarding four individuals indicted on 95 counts of conspiracy, mail fraud, and wire fraud regarding the sale of off-exchange futures contracts in which more than 700 investors were defrauded of approximately $7 million.

In addition, the State/Federal Liaison Unit conducted an educational seminar for state and federal enforcement officials in October 1984.

Planned Activities (FY 1986)

Staff will decline from 125 funded staff-years in FY 1985 to 123 funded staff-years in FY 1986. The staff estimates that it will only be able to open 135 investigations and 80 cases, and to complete 120 investigations and 75 cases. These estimates assume that no series of events in the futures markets will occur which by their combined magnitude require commitments of an extraordinary amount of investigative resources.

The Commission will carefully review its priorities to ensure that it continues to prosecute only those cases with the greatest enforcement value. The Commission expects to continue to maintain its primary enforcement focus on Commission registrants--those individuals and firms over whom the Commission

has exclusive jurisdiction--especially in the areas of trade practice and market manipulation. The Enforcement Division will continue to encourage other federal agencies and state regulators to be more vigorous in areas of commodity prosecution where they have the appropriate jurisdiction.

Impact of Current Level (FY 1987)

An Enforcement Program has two complementary aims: to maintain a credible presence in each of the principal areas of illegal activity and to conclude cases and investigations within a meaningful time after the facts in question occurred. Findings and sanctions decreed within such a time frame enhance the industry-wide deterrent impact of the Enforcement Program.

At the FY 1986 level, the Enforcement Program cannot achieve the needed impact in certain significant areas. As in past years, the Commission will continue to take enforcement action in all major areas. However, at the FY 1986 funding level it is estimated that only 135 investigations and 80 civil injunctive and administrative cases could be opened in FY 1987. The Commission has been successful over the last two years in resolving investigations in a timely fashion so that suspected wrongdoers are brought to justice more quickly. This trend of completing investigations in a more timely manner likely will be reversed in FY 1986, and investigations may lengthen in FY 1987. In addition, the backlog of pending cases will grow.

The large, complex and time-consuming matters, which are often highly significant, suffer the most from staff cuts. To pursue a major, complex investigation most efficiently can require five to twenty staff working full-time. For example, one major investigation required 15% of the Enforcement Division's resources for 2-1/2 years. Such a concentration of staff necessarily reduces the number of matters that can be pursued in other areas, thus reducing the Commission's enforcement presence. Therefore, when cutbacks in staff occur, the Commission cannot afford to commit such a large number of staff full time to one case at the expense of litigation or investigations in other critical areas.

Included in the Commission's five-year ADP plan are a number of systems for assisting the Enforcement Program. These computer systems are useful tools but they will not fully automate the investigative process nor reduce the number of staff-years required to carry out an effective Enforcement Program. As a result, while computer assistance will improve the efficiency of the investigative process, over the long term it will not automatically reduce the manpower needs. At best, computer enhancement for investigations results in a capability to address the increased trading volume and complexity involved in current investigations. Therefore, while violations may be identified by the computers, there may be insufficient resources to pursue them.

The assistance that the State/Federal Liaison Unit can offer state officials in commodity fraud cases will remain limited. Lacking resources either to assist the states or to initiate more than a handful of cases against off-exchange operations, the Commission cannot attack the growing numbers of these illegal operators. In FY 1985, various units of the Enforcement Division brought eleven cases against entities selling illegal off-exchange futures. However, during FY 1985, approximately 130 firms suspected by the Commission of engaging in the sale of illegal off-exchange futures contracts could not be investigated or prosecuted because of lack of resources. In addition, without

sufficient resources, the staff cannot conduct the kind of educational programs which will, in the long run, result in greater initiative by state and federal agencies in the off-exchange area.

Justification of the Request (FY 1987)

The addition of eight staff-years will allow the Enforcement Division to increase its impact, to respond more effectively to market emergencies or a surge in illegal activity, and to focus enforcement attention on the following important areas:

Price Manipulation and Trade Practice Investigations and Litigation: The prevention of price manipulation is one of the Commission's highest priorities and a major emphasis of its Market Surveillance Program. However, where prevention is not possible, vigorous prosecution is the only alternative. As discussed earlier, one manipulation investigation which resulted in a case filed in 1985 consumed about 15% of the enforcement resources for a period of 2-1/2 years. The prosecution of that case is expected to consume substantial resources in FY 1986 and FY 1987. An important adjunct to prevention of manipulation is the enforcement of speculative limits. The Enforcement Program receives referrals of possible speculative limit violations from Market Surveillance and investigates and prosecutes those cases. Neither manipulations nor speculative limit violations can be effectively policed by the exchanges or NFA alone because the violators are often non-members.

Abusive trading practices on the floor of an exchange can result in customers receiving less favorable prices to the advantage of traders on the floor. While the Commission is in the process of improving exchange audit trails, trade practice violations are often sophisticated schemes that are difficult to detect and prosecute. However, with the continuing growth in the volume of trading, the number of exchanges, the number of commodities and the number of traders on the floor, the Commission feels it must increase its impact in this area.

CPO/CTA Fraud: CPO/CTA fraud cases remain the largest single use of the Division's litigation resources and the Commission's needs in this area are increasing. The number of pool operators and trading advisors has increased from 1,269 and 2,390 in FY 1981 to 1,816 and 3,035 respectively in FY 1984. While NFA also regulates pools, at the present time both NFA and CFTC find fraud and abuse of customers' funds still occur in pools, requiring enforcement actions to support CFTC and NFA regulatory efforts. Cases in these areas often involve millions in customers' funds and can be vigorously contested. The Commission intends to coordinate programs in this area with NFA to insure maximum efficiency in utilizing our combined resources.

FCM and IB Fraud: During FY 1985, approximately 20% of the Division's total resources spent on all investigations and litigation were in investigations of possible fraud by futures commission merchants and their employees. This

devotion of resources reflects the Commission's commitment to this area. FCMs, the custodians of customer funds, should continue to be scrutinized closely. FCM managed account programs present special opportunities for abuse such as churning. The detection and proof of churning of customer accounts is a highly complex and resource intense matter requiring exhaustive analysis. Misrepresentation, sales practice abuse and unauthorized trading are also forms of FCM fraud which are detrimental to the integrity of futures trading and which require a high level of attention.

A new category of registrant, the Introducing Broker (IB), was created as a result of the 1982 legislation. The Commission has received complaints alleging IB's are committing the same types of fraud as FCMs, and the Enforcement Division has initiated investigations involving IBs. The number of IBs registered with the Commission has increased steadily, thus it is necessary to devote additional resources to this type of fraudulent activity in order to establish an enforcement presence in this new area. In addition, in many cases IB's had not previously been registered, supervised or audited by CFTC. As a result, NFA and the CFTC in its oversight capacity are finding it necssary to recommend enforcement investigations in an area not even previously covered by CFTC enforcement.

In this connection it is useful to note that the NFA's compliance procedures serve as a helpful adjunct to the Commission's Enforcement program in those areas and over those persons within its authority, such as FCMs, CPOs, CTAs and IBs.

However, the NFA cannot relieve the litigation needs of the Commission's Enforcement Program. This is in contrast to other areas, such as registration and auditing, where the NFA and other self-regulatory organizations (SROs) have assumed some of the Commission's responsibilities. Indeed, the efforts of the NFA increase the demands on the Commission's Enforcement resources because the actions the NFA can take are limited. Only the Commission can initiate cases in federal court to halt ongoing fraud, freeze assets, place defrauding firms in receivership, and seek disgorgement of unlawful profits. Thus, the need exists for a strong federal regulator with sufficient enforcement resources to act on NFA referrals and take swift action against fraudulent operators.

State/Federal Liaison: In the 1982 reauthorization, the Congress enacted the "open season" provisions of Section 12(e) of the Commodity Exchange Act, thereby greatly enhancing the ability of state officials to investigate and prosecute the unlawful sale of investments with a commodity theme that are not traded on Commission designated contract markets. Although this legislative development increased the ability of other law enforcement entities, especially those of the states, to attack the problem of such illegal activity, the Commission recognized that it would bear the burden in assisting these officials. In recognition of this obligation, the Commission established the State/Federal Liaison Unit in the Division of Enforcement with the mission of providing education and expertise to state regulators and prosecutors and the additional responsibility of bringing cases on behalf of the Commission alleging the

unlawful sale of off-exchange instruments. In addition, the Unit serves an informational function by collecting and storing data regarding individuals and firms suspected of engaging in this type of activity so that the information might be provided to appropriate state officials.

The Unit accomplishes its mission by coordinating joint actions with state officials, maintaining current information regarding suspected activity on a nationwide basis, keeping current information for the Commission's periodic Proceedings Bulletin, which will be released in the near future, providing seminars to teach state regulators the required methodology in pursuing commodity related wrongful conduct, and bringing cases on behalf of the Commission. Through the Unit, the Enforcement Division has conducted special training programs for assistant United States Attorneys and FBI agents, lectured on enforcement approaches for agents of the Internal Revenue Service and provided speakers at conferences of the North American Securities Administrators Association and the National Association of Attorneys General.

Although all Regional Offices of the Enforcement Division coordinate with local and other federal law enforcement officials, the State/Federal Liaison Unit reflects the Commission's permanent commitment to assisting state officials. The problem of off-exchange activity, which has been the subject of two investigations by the Senate Permanent Subcommittee on Investigations, is one that requires attention but should not detract the Commission from its primary obligation of providing effective law enforcement with respect to the approximately 70,000 individuals and entities registered with the CFTC and over whom the CFTC exercises exclusive jurisdiction. Nevertheless, the Commission recognizes that the problem is significant. Indeed, there are estimates that more than 130 firms currently may be involved in such illegal activities. While it is recognized that all of these individuals or firms who, by definition, are operating outside of the regulatory structure, cannot be investigated and prosecuted, the most egregious cases must be addressed by a coordinated law enforcement effort. The State/Federal Liaison Unit, in prosecuting cases itself and in assisting other federal and state officials in their efforts to impose both civil and criminal sanctions, serves as the focal point for this attack at the CFTC.

Through the State/Federal Liaison Unit and other units of the Enforcement Division, the Commission, in FY 1985, filed cases jointly with Michigan, Ohio, Illinois, Texas and Florida. Off-exchange cases are often complex and litigious requiring at least a staff year per case. In addition, it is necessary to provide for more educational seminars and work more closely with a greater number of states.

The eight staff-years requested will allow the Commission to devote increased attention to these areas.

MARKET SURVEILLANCE, ANALYSIS, AND RESEARCH

The Market Surveillance, Analysis, and Research program conducted by the Division of Economic Analysis keeps markets free and competitive by detecting and preventing threats of price manipulation or other major market disruptions caused by abusive trading practices. Futures markets that are free of manipulation and other anticompetitive forces can most effectively perform their vital economic functions of price discovery and risk transferral. The program accomplishes its objectives by: (1) monitoring daily all actively traded futures and options contracts on 13 exchanges for market composition, the activity of large traders, key price relationships, and supply and demand factors; (2) analyzing the terms and conditions of proposed and existing futures and option contracts to assure that they are not inherently susceptible to manipulation or price distortion; (3) performing special economic studies and analyses to support market surveillance and review of contract terms and conditions; and (4) providing expert advice on the economic activities covered by and the economic impact of the Commission's regulatory policies and decisions.

Resource Changes (FY 1987)

The Commission estimates that an increase of $319,000 is required for the Market Surveillance, Analysis and Research program for FY 1987. The increase includes the costs related to two additional staff-years and a share of the Commission's anticipated increase in operating expenses for FY 1987. Total request for FY 1987: $4,943,000.

	FY 1985 Actual	FY 1986 Estimate	FY 1987 Request
Staff-Years (FTE):			
Funded	97	97	99
Obligations (000):			
Comp/Benefits	$3,277	$3,451	$3,546
Other (Direct)	100	162	184
Other (Pro rata)	1,020	1,011	1,213
Total	$4,397	$4,624	$4,943

Market Surveillance

The primary objective of the Market Surveillance subprogram is to detect and prevent manipulation, threats of corners, and other market disruptions. Specifically, the staff:

-- Reviews daily market developments in all actively traded commodities, including foodstuffs, precious metals, interest rates, foreign currencies, petroleum products and stock indices, in order to detect price manipulation and other market disruptions in futures or options on those commodities;

-- Maintains contact with exchange market surveillance staffs and appropriate federal agencies to share critical information, communicate Commission concerns, and coordinate surveillance activities;

-- Keeps the Commission informed through weekly surveillance briefings of significant market developments and potential problems that may require Commission action and provides the Commission with special reports of significant market events for Commission review and action;

-- Enforces the Commission's speculative position limits and monitors enforcement of exchange speculative limit rules to reduce or eliminate harmful, excessive speculation;

-- Monitors trading for noncompetitive and abusive practices which tend to impair the market's functions of risk transfer and price discovery;

-- Assists the Division of Enforcement in the investigation and prosecution of suspected violations of the Commodity Exchange Act; and

-- Collects, verifies and processes essential market data on large traders' activities and open interest.

Resource Changes (FY 1987)

The Commission estimates that an increase of $216,000 is required for the Market Surveillance subprogram for FY 1987. The increase includes the costs related to one additional staff-year and a share of the Commission's anticipated increase in operating expenses for FY 1987. Total request for FY 1987: $3,308,000.

	FY 1985 Actual	FY 1986 Estimate	FY 1987 Request
Staff-Years (FTE):			
Funded	67	67	68

Accomplishments (FY 1985)

The Market Surveillance staff closely monitored trading in all expiring futures and option contracts in FY 1985. Working closely with the affected exchanges, the Market Surveillance staff successfully prevented a number of major market disturbances. When routine surveillance uncovered a potential problem, the staff intensified its efforts to obtain and analyze quickly all pertinent facts and to ascertain that the exchange also was actively monitoring the market and taking appropriate actions. Large traders and futures commission merchants were contacted frequently to secure the most current information on positions, delivery intentions, and market objectives as well as to advise them of their responsibilities toward assuring an orderly liquidation of threatening positions. As a result of these efforts, the Commission did not need to take formal emergency action in FY 1985, although two exchanges did so under close Commission scrutiny.

The Market Surveillance staff also worked extensively with the Commission's ADP section, providing the requirements for new and improved data support systems. By year end, the Market Surveillance staff had specified requirements for eight modules comprising systems which support futures and option surveillance. ADP has completed six of the eight modules, with significant progress made on the remaining two. This augmented ADP support is critical to the successful operation of the Market Surveillance program because of the greatly increased amount of data that requires analysis. Even with this substantial ADP support, however, the surveillance staff still relies on manual compilations of some key data.

Other significant accomplishments were:

— A two year study of the utilization of livestock futures markets by large hedgers was completed. This Congressionally mandated study was published as a supplement to the Commission's 1984 Annual Report.

— A detailed study of speculative trading of soybean futures and the association of that trading to price volatility and allegations of price manipulation was completed and submitted to the Commission.

— Twelve special analyses of unusual contract expirations were prepared. For example, special reports were submitted to the Commission on the impact of the severe Florida freeze on the orange juice market and on the record number of Treasury bond futures deliveries.

— Audits of 129 futures commission merchants were conducted to monitor compliance with Commission reporting rules for futures and options, and warning letters were sent to firms which did not fully comply. The number of audits was 11% below FY 1984 due to staff vacancies in market surveillance.

— Proposed amendments to reporting regulations were published that would automate the filing of required reports by futures commission merchants to improve the timeliness and accuracy of those data.

-- An in-depth review of the option surveillance program was conducted as part of the Commission's evaluation of the option pilot program.

-- Over ten instances of potential illegal activity were referred to the Division of Enforcement, and Market Surveillance staff assisted that Division in the prosecution of several other cases.

Planned Activities (FY 1986)

The challenge facing the Market Surveillance staff in FY 1986 is to conduct effective surveillance over approximately ten additional markets and expand its involvement in the audits of exchanges' market surveillance programs utilizing the same staffing levels as in FY 1985. To accomplish this goal, it is imperative that substantially more ADP support, in the form of efficiently operating software and hardware systems, be available. Planned development of new and more efficient ADP support systems for Market Surveillance that make data more accessible to economists through on-line systems under the Commission's five-year ADP plan must be implemented as soon as possible to enable the staff to keep pace with the expanded workload. In FY 1986, the volume of futures and options traded is expected to increase another 10 percent to about 186 million contracts, which is up 65 percent from 1982 when the option pilot program began.

Planned activities include the following:

-- Monitor an estimated 110 active futures and option markets on 13 exchanges for indications of price manipulation or market disruption and prepare about 1700 weekly surveillance reports for expiring contracts.

-- Work with ADP to expand existing ADP capabilities and implement new systems. For example, newly developed analytical systems for options should be implemented by early FY 1986. Also, the Commission has implemented regulations which would require more machine-readable submissions from FCMs. These new systems require additional training of staff and additional terminals for on-line inquiry, data updates, and corrections.

-- Process about 600,000 reports and examine about 32,000 reports for compliance with speculative position limits. Although all futures and options contracts now have speculative position limits, the FY 1986 staffing level will only permit concentration on those commodities with federal speculative limit rules and the more egregious instances of potential exchange rule violations.

-- Assist the Division of Trading and Markets in the auditing of two exchange market surveillance programs to assure that the programs are operating effectively.

-- Assist the Division of Enforcement in the investigation and prosecution of suspected violations of the Commodity Exchange Act by referring an estimated five cases to that Division and by assisting them on other cases as resources permit.

-- Prepare about 50 special surveillance-related analytical reports to develop a better understanding of the markets being monitored and to determine whether any additional regulatory action, including modification of contract terms, is required when unusual occurrences are noted.

Impact of Current Level (FY 1987)

The total volume of futures and option trading has increased from 112.6 million contracts in 1982 to nearly 179 million in 1985 and the number of contracts traded has increased from approximately 80 to 106 during the same period. Based on the applications currently on file with the Commission, this rate of growth is anticipated to continue. The rapid growth in futures and option volume and the expansion in the number, diversity and complexity of contracts will continue through FY 1987. At the FY 1986 level, the program could not be assured of preventing manipulation and other market disruptions in FY 1987 given the expanding number of contracts.

Effective surveillance requires an understanding of cash market conditions, including production, storage, and distribution of individual commodities and the activities of market participants. Under the current level, the Market Surveillance staff will not be able to develop the high degree of specialized knowledge necessary to monitor the rapidly expanding number of futures and option markets. With rapidly growing markets as diverse and complex as Eurodollars, soybeans, live cattle, stock index and crude oil futures, and options on gold and U.S. Treasury bond futures, it is necessary that surveillance economists specialize in related areas to maintain effective surveillance of those markets. The introduction of option contracts has added complex market instruments to the existing surveillance responsibilities. The Division estimates that it should have no more than four active futures or options instruments assigned to each surveillance economist in order most effectively to ensure that all markets, and particularly agricultural options, are monitored carefully for possible market disruptions. The actual ratio will increase to about six contracts per economist in FY 1987 if staffing is maintained at the current level. The Market Surveillance staff will have to concentrate its attention on the most actively traded markets, and it will not be able to monitor the less active markets as closely as planned. Since illiquid markets can result in market problems, this deficiency in surveillance coverage would be unfortunate.

Because of the growth in the markets and the pressing need to perform the type of surveillance described above, the Market Surveillance staff's ability to monitor and enforce speculative limits also will be impaired significantly at the current staffing level. Speculative limits are designed to reduce the risk of market disruptions and manipulations by preventing the amassing of extraordinarily large positions. The Market Surveillance staff will have to defer its plan to audit systematically each exchanges' enforcement of their futures and option speculative limit rules.

The FY 1987 projections assume that adequate ADP support will be available to help the Market Surveillance staff keep pace with its rapidly expanding workload. Substantial enhancements to ADP support of Market Surveillance, as contemplated by the five-year ADP plan, are essential to process and improve

economists' access to the large volume of data that the Market Surveillance staff must analyze daily and to maintain the quality of analysis. Enhanced ADP support also will be required to process the data that brokers will be required to submit in machine-readable form.

Justification of the Request (FY 1987)

To enable the Surveillance program to perform at an effective level, albeit not commensurate with the growth of the industry, an increase of one staff year over the FY 1986 funded level is required. This request takes into consideration the fact that during the past five years the size of the Market Surveillance staff has been reduced by 10 positions. That prior reduction reflects efficiencies achieved in processing the large quantities of data received daily that made a reduction in clerical staffing possible.

One additional surveillance economist is needed to achieve a ratio of 7 active markets per economist. Economists need to maintain a high degree of specialization in assigned markets to analyze the developments they encounter and to identify problems early enough to implement preventive actions. Economists must not only have a thorough knowledge of the terms and conditions of each contract, but must also understand all the factors in the underlying cash market which may affect the futures or option market. Additional specialization in option trading strategies also needs to be developed since options comprise the most rapidly growing segment in the industry since 1984.

Market Analysis

In order to ensure that futures and option markets operate efficiently without market disruption or price manipulation, the Market Analysis staff reviews and analyzes each application for contract market designation, as well as economically significant proposed changes to existing contracts. Deficiencies in the terms and conditions of futures and option contracts increase the likelihood of cash, futures, or option market disruptions and also decrease the economic usefulness and efficiency of a contract. To avoid these consequences, the Market Analysis staff analyzes the following for each contract application and proposed rule change that it reviews: (1) conformity of contract terms and conditions with commercial practices; (2) adequacy of deliverable supplies or, if applicable, cash settlement procedures; (3) commercial usefulness of the contract; and (4) public interest implications, as appropriate. In addition, the Market Analysis subprogram has responsibility for review of the terms and conditions of applications for the registration of leverage commodities.

Resource Changes (FY 1987)

The Commission estimates that an increase of $70,000 is required for the Market Analysis subprogram to support the Commission's ability to conduct adequate economic reviews of proposed futures and option contracts and changes in contract terms and conditions for FY 1987. The increase includes the costs related to one additional staff-year and a share of the Commission's anticipated increase in operating expenses for FY 1987. Total request for FY 1987: $983,000.

	FY 1985 Actual	FY 1986 Estimate	FY 1987 Request
Staff-Years (FTE):			
Funded	18	18	19

Accomplishments (FY 1985)

During FY 1985 the Market Analysis subprogram completed economic reviews of seven applications for new futures contracts, 16 applications for new option contracts, and 71 rule amendment packages for existing futures and option contracts.

Several of the futures contract reviews completed by the Market Analysis subprogram during FY 1985 involved significant new approaches to futures hedging. In particular, the contract on the consumer price index for urban wage earners and clerical workers (CPI-W) traded on the Coffee, Sugar and Cocoa Exchange is the first "macroeconomic index" futures contract. This contract is unique in offering the opportunity to hedge against the effects

of unanticipated changes in the rate of inflation or general price level. Another innovation is the Chicago Board of Trade's long-term municipal bond index contract, based on an index of the prices of 40 large, recently issued municipal bonds, which should offer better hedging opportunities for municipal bond portfolio managers than contracts based on Treasury securities.

Among the 16 option contracts approved by the Commission during FY 1985 were nine agricultural contracts, the first domestic agricultural option contracts to trade in the United States since the 1930's. These options are trading under a pilot program which the Commission approved pursuant to the Futures Trading Act of 1982. In addition, during FY 1985 two new commodity exchanges were established and designated by the Commission to trade option contracts for non-agricultural commodities--the Amex Commodities Corporation (Amex) and the Philadelphia Board of Trade (PHBT). Further, both the Amex and PHBT option contracts on gold bullion and Eurodollars, respectively, are options on physical commodities, the first options on physicals to be designated by the Commission.

The 16 option contracts designated by the Commission in FY 1985 represent the largest number of option contracts designated by the Commission during any fiscal year since the option pilot program began in 1982. In addition to the seven futures contracts designated during FY 1985, considerable staff time was devoted to the preparation of over 20 detailed deficiency letters issued in connection with the new statutory twelve-month time period for the review of designation applications. At the end of the fiscal year, final review of 17 futures and option contracts was pending exchange responses to these notices of material deficiencies.

During FY 1985, the economic review of 62 rule amendment packages for existing futures contracts was completed, including several which substantially changed the terms and conditions of the contracts. Economic review of 9 rule amendment packages for existing option contracts was also conducted. In addition, staff completed the review of the final two exchanges' proposals for speculative position limit rules applicable to 11 futures contracts for which exchange or federal speculative limits were not in place and the review of 18 leverage commodity registration applications.

Planned Activities (FY 1986)

During FY 1986, the Market Analysis subprogram expects to complete the economic review of 21 futures and nine option contracts and 65 rule amendment packages. These reviews are extremely resource-intensive and must be completed within statutory time frames established by the Futures Trading Act of 1982--one year for futures or option contracts unless the Commission notifies the exchange in writing of material deficiencies, which tolls the one-year period, and 180 days for rule changes. In the case of rule reviews, if rules are not approved or disapproved at the end of 180 days, the exchange may put the rules into effect without Commission approval.

During FY 1985, the Market Analysis staff's increased efficiency of its economic review function resulted in the completion of the Commission's review of proposed futures and option markets well within the one-year review period mandated by the statute. Further, these accomplishments during FY 1985 were in part due to the analytical work on such items which was started in FY 1984 when more staff resources were available. Completion of the reviews well before the end of the statutory one-year period has permitted an earlier introduction of economically useful futures and option markets while assuring adequate review of the proposed contracts.

In the beginning of FY 1986, the analysis subprogram expects to carry over 30 futures and option contracts, including fifteen financial instrument futures contracts filed during FY 1985. Further, the Commission expects at least 30 additional futures and option contracts to be proposed by exchanges in FY 1986 based on the historical rate of submissions and exchanges' indications of their plans to introduce new markets. Although more staff are needed to handle this growing workload during FY 1986, the subprogram will be two staff-years under its authorized ceiling because of the FY 1986 funding level. As a result, economic reviews for designation applications in FY 1986 will take longer than during past fiscal years, with many submissions requiring the full 12-month statutory time period to complete. Further, to manage a growing backlog during FY 1986 the Market Analysis staff may find it necessary formally to toll the statutory time period more frequently rather than working informally with exchanges to correct many types of contract deficiencies. With the extremely tight staffing level during this fiscal year, in view of the projected workload, it is estimated that there would be a carry over of a substantial portion of the FY 1986 submissions to FY 1987. Because of the one-year statutory review period, review of these contracts would have to be completed during the early part of FY 1987.

As in the case of designation applications, the Market Analysis staff's efforts to process proposed rule changes well within the statutory review period will be seriously impeded by the unavailability of a fully funded staff combined with a growing workload. The reviews of many rule changes may not be completed until the end of the 180-day period and may be less thorough than is necessary to avoid adverse market consequences.

Finally, review of 16 leverage commodity registration applications, many of which received extensive analysis during FY 1985, will be completed during FY 1986.

Impact of Current Level (FY 1987)

The rate of designation application submissions is expected to continue at a high level through FY 1987, due in part to the increased rate of applications for financial futures. The staff expects that 34 futures and option applications, including many complex and innovative contracts, should be reviewed during FY 1987, based on the historical rate of submissions and the growing backlog resulting from FY 1986 staffing restrictions. The backlog will continue to increase from an estimated 30 applications at the end of FY 1985 to 40 at the end of FY 1986 and 50 by the end of FY 1987 at the current level. The current level of staff will have difficulty completing reviews of these contracts within the statutory time limits, and some contracts will receive superficial or otherwise inadequate reviews in FY 1987. As a

result, flawed contract terms and conditions could cause significant market problems or otherwise decrease the usefulness and efficiency of the contracts.

The processing delays created by the FY 1986 staff restrictions will result in a backlog of pending rule change submissions which must be carried over into FY 1987. The staff expects to receive 70 rule changes for review during FY 1987. Under current staff levels, work on some pending futures and option rule changes will not be completed within the processing time mandated by the statute, and those submissions will then go into effect without Commission review.

Justification of the Request (FY 1987)

One additional staff-year is required for the Market Analysis subprogram to perform its functions effectively during FY 1987. This additional staff year is needed to provide careful analysis of proposed contract terms within the mandated review time and to detect flaws in contract design which could result in market congestion or price distortion.

In FY 1984 and FY 1985, the staff was able to process exchange submissions in less time than the full statutory review period, which resulted in a significant reduction in the backlog of pending contract designation applications and rule changes. In view of the projected workload, the FY 1986 staff restrictions will create delays in the review process, with many submissions requiring the full statutory period to complete. Further, the inflow of new futures and option applications and complex rule changes to older futures contracts is expected to continue at a high rate during FY 1986 resulting in a significant increase in the backlog of designations and rule changes by the end of FY 1986. Because of the increasing backlog of exchange submissions, it is necessary to add one additional staff-year in order to complete all reviews within the statutory deadlines in FY 1987.

Market Research

The Market Research staff performs the following functions:

-- Conducts economic research relevant to the formulation and implementation of Commission policy, such as the development of the regulatory structure for leverage contracts, dealer options, and options on physical and agricultural commodities.

-- Provides support for other programs or subprograms, such as assisting the Market Analysis subprogram with option designations and rule reviews and the Financial Audit subprogram with net capital and margin rules.

-- Provides economic analyses for enforcement investigations and expert testimony for litigation.

-- Performs research on, and evaluation of, the economic functions and pricing efficiency of the futures and option markets, such as the evaluation of the option pilot program prepared for the Congress; conducts special market studies, such as those related to the adequacy of contract terms and conditions; and maintains liaison with individuals in outside institutions performing similar research.

-- Provides technical support and assistance to other governmental agencies. Such activities have included staff support for the U.S.D.A.'s Agricultural Option Advisory Committee, assistance to the Internal Revenue Service concerning the economic nature of futures and options contracts, and expert advice to the U.S. Attorney's office.

Resource Changes (FY 1987)

The Commission estimates that an increase of $33,000 is required for the Market Research subprogram in FY 1987. The increase requested will maintain the funded FY 1986 staffing level and provide for a share of the Commission's anticipated increase in operating expenses for FY 1987. Total request for FY 1987: $652,000.

	FY 1985 Actual	FY 1986 Estimate	FY 1987 Request
Staff-Years (FTE):			
Funded	12	12	12

Accomplishments (FY 1985)

Major accomplishments in FY 1985 include the following:

— Completed a survey of eight option markets as part of the evaluation of these markets in conjunction with the completion of three years of the non-agricultural pilot option program.

-- Assisted in the development of the Commission's regulations on short leverage contracts, option trading, option margins, audit trail, capital concentration and commodity pools.

— Continued research on futures and option markets, including the interagency study of futures and option markets, evaluation of the pricing efficiency of the option markets, analysis of the effect of price supports on agricultural option pricing, a preliminary review of the nature and extent of pool trading in futures markets, and an investigation of the nature of domestic grain flows at major terminal and subterminal points.

-- Provided expert technical assistance and expert witnesses in enforcement cases.

-- Provided support for the Commission's Agricultural Advisory Committee and Financial Products Advisory Committee.

Planned Activities (FY 1986)

FY 1986 activities of the Market Research subprogram will focus on:

— Completion of studies of commodity pool trading and the nature of grain flows at major domestic terminal and sub-terminal locations.

— Assistance in the development of final regulations for dealer and exchange-traded options.

-- Support and assistance to the enforcement staff for special projects, ongoing investigations, and prosecutions.

-- Responses to Congressional information requests and Commission briefing needs resulting from the Commission's reauthorization.

-- Continued support for the Commission's Financial Products and Agricultural Advisory Committees.

-- Continued support for the Contract Analysis Section in review of selected option and futures contracts and rule changes.

Planned Activities at Current Level (FY 1987)

Staffing of the Market Research subprogram at the FY 1986 funded level will permit maintenance of support for the Enforcement Division's request for expert litigation assistance at near current levels. The Section will

also maintain its current level of support for the Contract Analysis sub-program in the review of selected futures, options, and rule change proposals. In addition, the Congressionally mandated U.S.D.A. pilot program for the testing of agricultural options as price-support alternatives will require participation by Section personnel.

REGISTRATION, AUDITS AND CONTRACT MARKETS

The Division of Trading and Markets (T&M), which operates the Registration Audits and Contract Markets program, proposes, implements and oversees enforcement of rules under the Commodity Exchange Act which are designed to protect customer funds, to prevent trading abuses before they occur and to assure the financial integrity of firms holding customer funds. The Division of Trading and Markets has responsibility for executing the Commission's oversight program, and, in particular, monitors the market surveillance, trade practice, financial, sales practice and other compliance activities of the designated contract markets and registered futures associations through periodic, routine and targeted field inspections. T&M's job is to foresee problems and take steps to minimize them. In this connection, the Division also supports the Commission's enforcement program by referring problems uncovered in the course of its oversight activities for further action and by providing expert testimony and records analysis.

The Registration, Audits and Contract Markets program has four subprograms: Registration, Audit and Financial Review, Front Office Audit, and Contract Markets and Registered Futures Associations. The Division processes registration applications for the limited categories for which it retains direct responsibility, oversees NFA's registration program, and handles exemption and relief requests; oversees the review of financial integrity of registrants to ensure the safety of customer funds; oversees the review of sales, marketing and account handling by commodities firms and individuals to ensure full disclosure of risks and costs and the proper handling of accounts; reviews exchange rules and contract designation proposals to ensure compliance with statutory public interest requirements; and oversees and evaluates the self-regulation of trading on the exchanges. Each of these areas is discussed below.

Resource Changes (FY 1987)

The Commission estimates that an increase of $317,000 is required for the Registration, Audits and Contract Markets program in FY 1987. The increase includes the costs related to two additional staff-years and a share of the Commission's anticipated increase in operating expenses for FY 1987. Total request for FY 1987: $5,411,000.

	FY 1985 Actual	FY 1986 Estimate	FY 1987 Request
Staff-Years (FTE):			
Funded	104	95	97
Obligations (000):			
Comp/Benefits	$3,785	$3,828	$3,906
Other (Direct)	201	265	302
Other (Pro rata)	1,093	1,001	1,203
Total	$5,079	$5,094	$5,411

Contract Markets and Registered Futures Associations

The Contract Markets and Registered Futures Associations staff carries out one of the Commission's most vital functions -- the oversight of industry self-regulation. In particular, the staff assures that the rules and practices of the 13 exchanges and of the National Futures Association are in compliance with the provisions of the Commodity Exchange Act and the rules of the Commission and are affirmatively enforced by those self-regulatory organizations (SROs). All exchange applications for designation as a contract market and all exchange and NFA rule submissions must be reviewed for compliance with the Act, particularly where those submissions relate to an SRO's ability to fulfill its statutory responsibilities or where competition would be affected. The Section conducts rule enforcement reviews of exchanges. The scope of these reviews is determined based upon the circumstances of each exchange's programs; when appropriate, follow-up reviews or reviews of the same issue on a number of exchanges ("horizontal reviews") are conducted. The Section's oversight function also includes trade practice investigations, which have been redesignated as targeted oversight reviews, on-site market surveillance, and review of disciplinary actions taken by exchanges and the NFA to ensure the integrity of the markets and the effectiveness of self-regulation. The staff also must continuously review NFA's implementation of its self-regulatory functions. The creation of NFA and of two new exchanges has substantially increased the workload of the Unit. In addition to these oversight activities, the Section conducts special studies of exchange floor practices, such as the Commission's recent initiative in the area of exchange audit trails.

The oversight function performed by the Contract Markets and Registered Futures Associations subprogram is enforcement related. Rule enforcement reviews are designed to identify any failures in exchanges' programs in the enforcement of their rules. When such deficiencies are identified, the Division of Trading and Markets recommends that appropriate corrective action be taken by the exchange. These reviews as well as other subprogram oversight functions also serve to identify specific violative trading activity by exchange members which is then referred to the exchange or the Division of Enforcement, as appropriate. As a result of this intensive oversight process, the Commission has been able to obtain significant improvements in exchange self-regulatory programs.

Resource Changes (FY 1987)

The Commission estimates that an increase of $125,000 is required for the Contract Markets and Registered Futures Associations subprogram for FY 1987. The increase includes the costs related to two additional staff-years and a share of the Commission's anticipated increase in operating expenses for FY 1987. Total request for FY 1987: $1,896,000.

	FY 1985 Actual	FY 1986 Estimate	FY 1987 Request
Staff-years (FTE):			
Funded	34	33	35

Accomplishments (FY 1985)

During FY 1985, the Contract Markets and Registered Futures Associations staff accomplished the following:

-- Recommended Commission approval of 1,218 rules and rule amendments submitted by the exchanges and NFA, which is over twice as many as projected for FY 1985. The increase was due, to some extent, to the designation of two new exchanges. In addition, the Division reviewed 176 other rules which did not relate to terms and conditions of contracts.

-- Reviewed and recommended Commission approval of 23 applications for designation as a contract market in either futures or options, including the designations of two new exchanges. For each new designation requested, the staff reviewed the exchange's proposed trading rules for compliance with the Act and the Commission's regulations and the adequacy of the exchange's rule enforcement program. (The Division of Economic Analysis applies an economic purpose test to each proposal.) Where an exchange has not previously been designated as a contract market, the Division staff must review not only the contract which the exchange has initially proposed for trading, but also the exchange's entire rulebook, including the exchange's disciplinary, minimum financial, arbitration, and other rules for consistency with the Act and Commission regulations. In addition, where an exchange is seeking designation to trade options for the first time, the staff must analyze the exchange's programs for compliance with the special safeguards that have been established for options trading, including the exchange's option margin rules. This latter analysis alone consumes, on the average, 500 staff-hours per exchange. The two new exchanges designated by the Commission during FY 1985 — the Amex Commodities Corporation and the Philadelphia Board of Trade, subsidiaries of the American and Philadelphia Stock Exchanges, respectively — also proposed new types of trading systems which required substantial additional technical and legal analysis to determine if they were consistent with the requirements of trading by open outcry specified by the Act and regulations. These two designations alone required 2200 Division staff-hours for review.

-- Conducted rule enforcement reviews of the self-regulatory programs of eight of the 13 domestic commodity exchanges. These reviews required the expenditure, in the aggregate, of more than eight staff-years. Four of the eight reviews were follow-up audits conducted to determine whether corrective action has been taken in response to earlier reviews. Four full-scope reviews were conducted because significant time had elapsed since the prior review.

-- Coordinated the transfer of the majority of the Commission's registration processing responsibilities to NFA in conjunction with the Registration subprogram. Effective December 3, 1984, NFA assumed the responsibility for

processing applications for registration and related materials filed by the more than 60,000 futures commission merchants, commodity trading advisors, commodity pool operators, and their associated persons that are registered with the Commission. (Staff of the Division of Trading and Markets, including Contract Markets and Registered Futures Associations staff, contributed approximately half of the more than 7,000 staff-hours that were expended by the Commission on the completion of this project.) The transfer required the Commission to: draft and adopt new regulations; prepare, approve, print, and mail thousands of sets of new instructions for the required forms; adopt and publish new Privacy Act "routine uses" so that NFA could have access to confidential information; develop new procedures to assure the security of the transferred records as well as to assure prompt public access, consistent with Federal statutes, to the information contained therein; develop procedures to assure the prompt production and certification of needed records in support of the Commission's enforcement program; review and approve NFA's own rules implementing these procedures; advise the more than 60,000 individuals and firms that were registered with the Commission of the change; and check over 100,000 registration records and thousands of computer files before their transfer to NFA.

-- Conducted a special study of the exchanges' "audit trails" and their ability to accurately reconstruct trading when necessary to detect and prove illegal activity; prepared a rule proposal to implement the Division's recommendation that each exchange be required to develop rules to assure the precise and rapid reconstruction of the order of trading in its markets (this proposal was prepared in part as a result of the Commission's FY 1984 "insider trading" study); and recommended final Commission rules after consideration of the comments filed with the Commission and evaluation of studies and technical data.

-- Identified instances of possible violations of the Act and Commission regulations in the course of routine oversight of exchange self-regulatory activities. These possible violations were then directed to the Division of Enforcement, in nine referrals of multiple parties and transactions, for further investigation and potential enforcement action. Among these were several cases of noncompetitive trading by floor brokers, and dual trading abuses, such as trading ahead of customer orders.

-- Completed 44 targeted oversight reviews (trade practice investigations). These reviews are one of the primary methods by which the Commission detects unlawful trading activity. In addition, these reviews serve to determine the efficacy of an exchange's own program for trade practice surveillance.

-- Developed and obtained Commission approval of simplified and streamlined procedures for the review of certain types of rules for which affirmative approval by the Commission is required by the Act, in order to expedite the rule review process and allow the staff to focus its attention on more significant matters.

-- Reviewed 511 notices of disciplinary actions filed by self-regulatory organizations. These notices are reviewed for the propriety and sufficiency of the sanctions levied by the exchanges.

-- Reviewed and recommended appropriate Commission action with respect to seven applications for Commission review of exchange disciplinary or other adverse actions, a substantial increase over prior years.

-- Reviewed three exchange emergency actions taken pursuant to Commission regulation 1.41(f).

Planned Activities (FY 1986)

During FY 1986, the staff will:

-- Conduct four limited-scope rule enforcement reviews and three follow-up reviews, a decrease from FY 1985 in which a total of eight reviews were done.

-- Conduct 50 targeted oversight reviews, focusing on newly-designated contracts, where the potential for abuse is often greatest, on options trading, and on the operation of selected trading rules.

-- Monitor the implementation and effectiveness of the exchanges' audit trail systems.

-- Assess the performance of the National Futures Association. The Futures Trading Act of 1982 required the Commission to report to Congress by January 1, 1986 on the extent to which NFA has fulfilled its self-regulatory obligations. The staff prepared a comprehensive report which evaluated NFA's progress through September 30, 1985 and which identified measures NFA must take to continue to improve its performance.

-- Review approximately 30 applications for contract market designation for futures and options trading and at least one application for designation of a new exchange.

-- Review approximately 1375 rules submitted to the Commission by the exchanges and NFA. It is expected that the staff will also need to consider and recommend appropriate action with respect to several significant, complex, and time-consuming exchange rule proposals during FY 1986. These include exchange rule filings involving: trading "linkages" between domestic and foreign exchanges, including the use of a domestic market's clearing organization for all "linked" trades; exchange membership reclassifications and restrictions which may unfairly affect competition; and new and novel financial safeguards and other arrangements adopted by the exchanges and their clearing organizations.

-- Develop final rules to govern the expanded trading of commodity options if the Commission's "pilot program" for options on non-agricultural commodities is terminated.

-- Improve and streamline the Commission's program for appeals from exchange disciplinary and membership denial decisions.

Impact of Current Level (FY 1987)

Because of expected proposed new futures exchanges; growth in number, novelty, and volume of contracts traded; new international and domestic exchange linkages, formal and informal; potential expansion of the Commission's pilot programs for options trading; and the need to conduct more targeted oversight examinations in conjunction with broader scope rule enforcement reviews, the subprogram's responsibilities are substantially increasing. Continuing the level of resources proposed for FY 1986 during FY 1987 would restrict the frequency and scope of oversight by the subprogram. Restrictions on the frequency or the scope of reviews may result in the continuation of inadequacies in exchange compliance programs which may prevent the detection of illegal trading activity. It is expected that there will be 15 exchanges in FY 1987. This increase in the number of exchanges dictates that there be at least a 25% increase in the number of oversight rule enforcement reviews (excluding followup reviews).

Operating at fiscal year 1986 staffing levels during fiscal year 1987 will also reduce the ability of the subprogram to perform an increased number of targeted reviews to keep pace with the growth of the futures industry and changes in trading practices. There should be at least a 10% increase in the number of targeted oversight reviews. The subprogram also expects to receive more notices of exchange and NFA disciplinary actions as the markets grow and the diligence of self-regulatory oversight increases. At the FY 1986 staffing level, the reviews of exchange disciplinary actions to determine the propriety and sufficiency of sanctions levied in FY 1987 would result in a backlog of about 100 notices. Finally, the subprogram's ability to timely process appeals to the Commission from adverse exchange actions pursuant to Section 8c of the Act would be reduced by delays of six months or more.

Similarly, even taking into consideration the significant new streamlining procedures and measures adopted by the Commission and its staff during FY 1985, the Division may have difficulty in FY 1986 meeting the statutory deadlines of 180 days for rule changes and one year for new contracts, given the increasing complexity of exchanges' contracts and trading programs and the development of new risk management technology. Because of this increase in complexity, the Division also believes that there may be a backlog of exchange rules and new contracts from FY 1986 in FY 1987.

The Division anticipates an increasing number of applications for new futures and option contracts in FY 1987. At the FY 1986 level, the staff could not review these applications in a timely fashion. The Division also anticipates that the increasing number of exchanges and the continued internationalization of the markets, both through formalized trading "linkages" and otherwise, will reduce the resources it has available for the rule review and oversight process. Because of these increasing responsibilities, continuing the proposed FY 1986 staff level in FY 1987 will have material adverse consequences on the subprogram. Specifically, the subprogram may not be able to ensure consistency of treatment between and among the exchanges on similar issues, to respond effectively to exchange rule submissions which have either an anticompetitive purpose or

effect, and, in general, to adequately identify and analyze regulatory issues raised by rule submissions.

In the course of fulfilling these oversight functions, the subprogram has developed and will continue to develop approaches which provide for staffing economies, such as the increased use of limited-scope reviews instead of full-scope reviews and the recent amendments to regulation 1.41 which streamline the rule review process. Those economies, however, are substantially outweighed by the factors identified above as well as the Commission's stated intention, based upon the internationalization of the markets and the Volume Investors default, that the Division intensify its oversight of clearing and financial functions of exchanges and clearinghouses. The Contract Markets and Registered Futures Associations subprogram, in conjunction with other Division staff, will need to devote substantial staff time to planning for, developing and executing a significantly expanded program to accomplish these changes in its current oversight schedule.

Justification of the Request (FY 1987)

In order to prevent a significant deterioration in the breadth and focus of the Commission's overall oversight program, to effectively respond to new developments, and not to impede the development and listing of new and innovative contracts by the exchanges, the subprogram requires, at a minimum, two additional staff-years in FY 1987. These staff-years will be devoted to all aspects of the subprogram's oversight of trade practice activities, including rule enforcement reviews, targeted oversight reviews and on-site market surveillance. Further, if the Commission is successful in transferring its remaining registration processing functions in FY 1986, the three staff-years expected to be devoted to this purpose will be redeployed to the Contract Markets and Registered Futures Associations Section to assist in the oversight review function. These additional three staff-years will participate in all aspects of the subprogram's oversight program in both the rule enforcement and rule review areas. This additional staff will enable the subprogram to increase the number of rule enforcement reviews and follow up reviews in FY 1987 to ten as compared to eight currently planned in the absence of those three additional staff-years, increase targeted oversight reviews in FY 1987 to 70 as compared to 50 currently planned in FY 1987, and to review 1,100 exchange and NFA rules and 34 proposed contract market designations within statutory timeframes.

Registration

As the result of extensive Commission activities during FY 1985, NFA is now authorized to perform and is performing all registration processing functions, including the conduct of proceedings to deny, condition, suspend, restrict or revoke registration, for all categories of registrant except floor brokers, leverage transaction merchants ("LTMs") and associated persons of LTMs. A significant new function of the Registration staff, therefore, is to conduct oversight audits of the NFA registration program.

With respect to those categories of registrant for which the Commission retains registration responsibility, the Registration staff screens applicants for prior activities which may render them unfit to handle the accounts and funds of commodity customers, grants registration licenses and maintains the official registration records of the Commission. The staff also answers inquiries about registration status from other parts of the Commission, other State and federal enforcement agencies, and from the public. In addition, the staff participates in the process of revoking, suspending, restricting and denying applications.

The Commission retains the responsibility for appeals of NFA registration decisions, exemptions from the registration provisions, and further development or amendment of the registration regulations. In addition, the Registration staff continues to support the Enforcement Division and the Office of Proceedings in obtaining documentation from NFA concerning the status of registrants.

Resource Changes (FY 1987)

The Commission estimates that an increase of $25,000 is required for the Registration subprogram in FY 1987. The increase requested will maintain the funded FY 1986 staffing level and provide for a share of the Commission's increase in operating expenses for FY 1987. Total request for FY 1987: $636,000.

	FY 1985 Actual	FY 1986 Estimate	FY 1987 Request
Staff-Years (FTE): Funded	16	8	8

Accomplishments (FY 1985)

In FY 1985, Commission staff processed 6,462 applications from floor brokers (FBs), three applications from leverage transaction merchants (LTMs) and 260 applications from associated persons of LTMs. In addition, through December 3, 1984, CFTC processed a total of 703 firms and approximately 2,500 individual applications for the categories which were transferred to NFA, resolved 22,000

problem registration records, prepared approximately 100,000 files for transfer to NFA, and completed a microfiche record of all transferred data.

In the first quarter of FY 1985, effective December 3, 1984, the Commission transferred to NFA the authority to process and, where appropriate, grant registration to applicants for registration as an FCM, CTA, CPO or as an associated person of such registrants. NFA had previously been authorized to process applications for registration as an introducing broker and associated person of an introducing broker. It was not until just prior to the end of FY 1985, however, that the Commission authorized NFA to conduct proceedings to deny, condition, suspend, restrict or revoke registration. Throughout FY 1985, therefore, NFA referred to the Commission all applications in which there was a question of fitness. Commission staff also retained responsibility during FY 1985 to review, investigate and take appropriate action leading to denial or withdrawal of the application in such cases. Commission staff reviewed 900 referrals from NFA and performed in-house investigations, leading to 113 applications for registration being denied or withdrawn.

In connection with the transfer of authority to NFA, Commission staff developed an intensive transfer plan, analyzed and critiqued the NFA processing steps and recommended constructive changes, assisted in designing temporary licensing software, detailed the technical requirements for the outputs needed by the Commission, developed procedures for the maintenance and certification of Commission files controlled by NFA, adopted appropriate routine uses and facilitated coordination by NFA with the FBI and the SEC on fitness issues, implemented a new computer program for those categories of registrant for which the Commission retains authority, and developed procedures for hearing appeals from NFA registration proceedings.

In FY 1985, Commission staff worked in close coordination with NFA staff to assist in the implementation of NFA's processing program to produce certifications of the contents of registration files for Commission administrative proceedings as well as federal and state proceedings. In addition, the Registration staff completed its first detailed audit of the NFA registration program.

The Commission currently has full responsibility for registration of floor brokers, LTMs and their associated persons. Although the Act permits the Commission to delegate the registration of LTMs, their APs and floor brokers to NFA, NFA cannot be required to accept this responsibility because these registrants are not NFA membership categories under NFA's Articles of Incorporation, and the Commission can only mandate that NFA assume registration processing for its members. In addition, since the regulation of leverage transactions is a new program, initial implementation requires the direct involvement of CFTC staff to bring LTMs into compliance, make appropriate rule changes and grant exemptions where appropriate. Delegation to a self-regulatory organization in this program implementation stage would be premature. Nevertheless, the Commission intends to explore the possible delegation of responsibility for these categories to NFA or another self-regulatory organization during FY 1986. This would be necessary if a decision were made to lift the moratoria as the Commission staff available to handle registration would be insufficient to address an expanded program.

Finally, the Commission adopted a regulation requiring the contract markets to prohibit any person from acting as a floor broker unless that person is registered as such with the Commission. The regulation took effect October 1, 1985. In this connection, the Commission initiated the preparation of monthly reports of registered floor brokers to assist the contract markets in enforcing this prohibition.

Planned Activities (FY

In addition to [illegible] respect to those categories of registr[illegible] thority, a significant portion of the [illegible] d to oversight of the NFA registration pro[illegible] 986 will be the first year that NFA will have author[illegible], suspend, restrict or revoke registration as well as grant [illegible] registration, it will be important to monitor its activities in this regard for compliance with the relevant provisions of the CEAct and the regulations and orders of the Commission thereunder. This program will review the NFA program in operation and in particular how the delegated authority is exercised. Commission review of NFA registration actions will also be required. The Commission will also work on a plan in FY 1986 to transfer responsibility for its remaining registration processing functions.

The Registration staff, in cooperation with other subprograms, will also draft proposed regulations regarding the offer and sale in the United States of futures contracts that are to be entered into on a foreign board of trade. These proposed regulations would implement the provisions of Section 4(b) of the Act, which gives the Commission plenary authority to regulate the sale of such foreign futures in the United States.

Planned Activities at Current Level (FY 1987)

The Commission's Registration subprogram will require eight staff-years in FY 1987, the same as the funded FY 1986 level. Approximately three staff-years will be required to process approximately 7,200 applications for registration filed by floor brokers, LTMs and associated persons of LTMs and to produce monthly reports for the contract markets to assist in their enforcement of the floor broker registration requirement.

An estimated three staff-years will be required to oversee NFA operations and procedures for compliance with the Act and regulations, and to coordinate the exchange of registration information between NFA and the CFTC. These staff-years will also assist in the development of simplified registration rules and forms and will process requests for exemption from Commission registration requirements found in regulations 3.12, 3.16, 3.18 and 3.32, relating generally to multiple affiliations, and changes in control, and will handle withdrawals by firms, functions which will not be assumed by NFA.

Two staff-years will be required to participate in appeals to the Commission of NFA registration decisions; to investigate firms and individuals which have failed to register, and to obtain voluntary compliance or develop information to support prosecution by the Division of Enforcement; to provide testimony for CFTC, criminal and other cases in all historical registration matters; and to produce records and provide affidavits with respect to registration by the CFTC.

If the Commission is successful in transferring its remaining registration processing functions in FY 1986, the three staff-years expected to be devoted to this purpose will be redeployed to the Contract Markets and Registered Futures Associations Section to assist in the oversight review function.

Front Office Audit

The Division's Front Office Audit subprogram conducts the Commission's oversight of self-regulatory customer protection programs in the areas of sales, marketing, and account management as required by the Act and the Commission's regulations. These programs are intended to ensure public confidence in the marketplace by preventing fraudulent or misleading practices in the marketing of futures and options and the handling of customer accounts at the retail level. The Commission relies on the self-regulatory compliance audit programs of NFA and the exchanges in this area to maintain high professional standards. The subprogram oversees these efforts through periodic rule enforcement reviews of the self-regulators to ensure the maintenance of acceptable sales practice audit programs. In appropriate cases this activity may result in referrals to the Commission's Division of Enforcement or to the self-regulatory organization ("SRO"). The staff carries out oversight audit fieldwork of FCMs, CPOs, CTAs, and IBs on a limited basis to test the efficacy of self-regulatory programs, to keep current with industry retail practices, and to address special concerns such as the operations of IBs and the marketing of options. The staff also conducts direct sales practice audits of firms which are not under the jurisdiction of NFA or the exchanges such as leverage transaction merchants ("LTMs"). The staff reviews CPO and CTA Disclosure Documents to make sure that all the disclosures required by the Commission's rules are made and responds to requests for interpretations of CPO, CTA and related rules. An important corollary activity is support of Enforcement Division cases against registrants which involve abusive sales tactics. Such support includes expert testimony with respect to sales practices of FCMs and disclosure requirements of CPOs and CTAs.

The subprogram's responsibilities will increase dramatically in FY 1986 and 1987 because of the implementation, for the first time, of an industry-wide futures and options sales practice audit program under the auspices of NFA. The Unit will be required not only to review, in detail, NFA's program but also the sales practice audit operations of the exchanges with which NFA may contract to carry out sales practice audits. Such reviews will be particularly important in FY 1986 and 1987 to assure the adequate start-up of such programs.

Resource Changes (FY 1987)

The Commission estimates that an increase of $41,000 is required for the Front Office Audit subprogram for FY 1987. The increase requested will maintain the funded FY 1986 staffing level and provide for a share of the Commission's anticipated increase in operating expenses for FY 1987. Total request for FY 1987: $715,000.

	FY 1985 Actual	FY 1986 Estimate	Agency Request
Staff-Years (FTE): Funded	14	13	13

Accomplishments (FY 1985)

In FY 1985 the Front Office Audit staff accomplished the following:

-- Carried out a follow-up review of NFA's sales practice audit programs, including 54 test audits of NFA's sales practice examinations of FCMs, IBs, CPOs and CTAs.

-- Worked closely with NFA management in the creation of appropriate rules in the areas of sales practices and customer protection and in the implementation of compliance programs to enforce these rules.

-- Conducted four annual follow-up reviews of the options sales practice audit programs of the exchanges acting as DSROs for sales practice audits of exchange-traded options and initial reviews of the options sales practice audit programs of two exchanges offering trading in options on physical commodities.

-- Continued two audit the sales practices of LTMs.

-- Reviewed and processed disclosure documents for a total of 1,300 CPOs, and CTAs, with approximately 450 deficiency letters being issued as the result of these reviews. Issued 115 responses to formal requests for interpretation and for exemption from the rules governing the operation of CPOs and CTAs. Responded to over 2,000 telephone inquiries regarding CPO and CTA operations.

-- Completed drafting of final rule 4.5 pertaining to the exclusion of certain otherwise regulated persons from the definition of the term "commodity pool operator" and certain amendments to other rules clarifying the application of Commission rules to certain institutional market participants.

-- Continued to provide expert advice in connection with Commission enforcement cases and in connection with actions brought by other federal agencies and the states.

Planned Activities (FY 1986)

The oversight of sales, marketing and account management practices will continue to be a high priority during FY 1986 because of the following:

-- Each of the exchanges which have been designated for trading in commodity options must continuously demonstrate an ability to implement an options sales practice audit program to prevent abusive sales practices in connection with contracts traded on the exchange.

-- At present, the Commission permits a qualifying exchange to offer two agricultural options and eight non-agricultural options. The exchanges are continually filing applications for new options and at least one exchange has petitioned for an expansion in the number of agricultural options permitted to be traded. The Congress has mandated that careful oversight of the marketing of such options be carried out.

-- The continued increase in the number and types of designated futures contracts which require ongoing oversight to ensure that misleading sales tactics are not used in the sales of such contracts. This oversight is essential because many of the new contracts are novel and complex.

-- The decision by a number of branch offices of FCMs, because of economic factors, to apply for independent registration status as IBs. The Commission has a continuing role in preventing abusive sales tactics on the part of these new independent registrants.

-- The fact that by September 30, 1985, the NFA was required to have in place comprehensive, industry-wide sales practice standards together with an audit program to monitor for such standards nationwide. Sales practice audits of exchange members will be carried out by exchange audit departments under contract with NFA. NFA has contracted with four exchanges to carry out general sales practice audits of the sales marketing and account management practices relating to all contracts under Commission jurisdiction. In view of the fact that the Commission has found that NFA's program continues to need operational improvement, the Commission will not be able to rely on NFA oversight of these contracts. Rather, as with NFA, the Commission staff will be required to review exchange sales practice audit programs in detail to guide the development of exchange programs and ensure adequate implementation of such programs.

-- The assumption that regulated leverage will continue and solicitation of participations in commodity pools and by commodity trading advisors will continue or exceed the present level.

In view of these facts, planned oversight activities in FY 1986 will seek to focus on the following most critical customer protection areas:

-- The subprogram will review the sales practice audit programs of at least three exchanges and will carry out a limited-scope review of NFA audit operations focusing on NFA's contract arrangements for carrying out sales practice audits. The exchanges will be selected on the basis of factors such as the volume of trading and the number of firms for which they are reponsible.

-- The subprogram will audit all registered LTMs and FCMs handling dealer options which are not subject to audit by a self-regulatory organization.

-- The subprogram will directly audit a limited number of IBs selected on a geographic basis to determine the effectiveness of industry self-regulatory audits.

-- The subprogram will review a sample of incoming disclosure documents for compliance with Part 4 of the Commission's regulations. Such sample will be based on the receipt of customer complaints and similar factors. This sampling will only be employed when it is ensured that NFA is conducting fully satisfactory reviews of disclosure documents.

Planned Activities at Current Level (FY 1987)

The oversight of sales, marketing and account management practices will continue to be given high priority in FY 1987.

The industry-wide sales practice audit program devised and conducted by NFA should be fully operational by October 1, 1986. NFA has delegated the conduct of audits of the major FCMs and their branches and IBs to four exchanges, with NFA retaining only the conduct of audits of non-exchange member FCMs and independent IBs. As the techniques for these audits are new to exchanges and to NFA and as the industry continues to increase the number and types of designated futures contracts, many of which are novel and complex, intensive oversight of sales practice audit programs will be required. In addition, each of the exchanges which has been designated for trading in commodity options must continue to demonstrate an ability to implement an options sales practice audit program which ability will require continuous review. The subprogram will therefore focus upon rule enforcement reviews of both general and options sales practice audit programs. It is anticipated that these will be conducted on a biannual basis, with up to ten reviews, covering both programs, being conducted in FY 1987. Also, approximately 70 test audits of FCMs, IBs and branch offices will be conducted to verify the efficacy of the self-regulatory audit programs.

Audits of authorized LTMs will be conducted on an annual basis as these entities are not audited by NFA or any other DSRO.

Disclosure documents submitted by CPOs and CTAs will be reviewed on a sample basis. This sampling will be dependent upon the ability of NFA to review these documents to ensure adequate compliance with Part 4 of the regulations and upon the complexity of the documents. The subprogram will also review documents upon receipt of complaints from customers and upon requests for clarification of compliance. It is anticipated that at least 500 documents will be reviewed in FY 1987. Requests for exemption from and interpretations of Part 4 of the regulations will continue to be acted upon.

Financial Audit and Review

The central purpose of the Financial Audit and Review subprogram is to prevent the misuse of customer funds and to ensure the financial integrity of the marketplace through effective oversight of industry self-regulation. The subprogram conducts financial oversight reviews of the self-regulatory activities of the commodity self-regulatory organizations ("SROs"); performs financial investigative audits of FCMs and other registrants; provides expert testimony in enforcement cases; assists other law enforcement agencies in commodities-related cases; participates in and initiates the Commission's financially oriented rulemaking; provides interpretations of the Commission's financial regulations; and provides accounting and financial expertise and advice in support of special projects. The subprogram also keeps abreast of developments in the accounting field and coordinates with other government regulators on financial issues.

The subprogram's oversight duties involve the performance of ongoing reviews of the audit and financial surveillance programs of the commodity SROs whereby the SROs determine compliance by their member-FCMs with minimum financial requirements and monitor their financial integrity, especially in difficult market conditions. The SROs also perform periodic audits of books and records of member FCMs to monitor ongoing compliance with financial, segregation and recordkeeping requirements. The subprogram's reviews are performed to monitor the effectiveness of the SROs' programs in the aforementioned areas. Investigative audits are tailored to specific cases where violative conduct is suspected or where there is a financial emergency which threatens customer funds. Special reports are prepared in financial cases which have broad regulatory implications, setting forth not only the facts, but analyzing the case's implications for the Commission's regulatory framework and providing recommendations for improvement.

Resource Changes (FY 1987)

The Commission estimates that an increase of $126,000 is required to maintain the Financial Audit and Review subprogram in FY 1987. The increase requested will maintain the funded FY 1986 staffing level and provide for a share of the Commission's anticipated increase in operating expenses for FY 1987. Total request for FY 1987: $2,164,000.

	FY 1985 Actual	FY 1986 Estimate	FY 1987 Request
Staff-Years (FTE):			
Funded	40	41	41

Accomplishments FY 1985

During FY 1985, the Financial Audit and Review subprogram accomplished the following:

-- Completed four financial oversight reviews of exchanges and NFA, including the oversight audit work necessary to support the Division's conclusion as to the final implementation of NFA's financial compliance program. Substantial work towards an additional three reviews was completed during the year, but due to the preparation of a special report upon a default in the futures options markets, these reviews will be finalized and issued in FY 1986. Approximately 13 staff-years were expended in on-site audit work at the SROs. An additional 15 staff-years were expended in performing oversight audit work on-site at registrants to monitor the quality of SRO field audit work.

-- Conducted 28 financial investigative audits. The staff audited respondents, identified capital and segregation violations for which receivership was indicated, isolated potential misreporting or failure to report material inadequacies in internal controls, detected certain accountant failures, provided factual support for obtaining receivers, provided expert testimony in enforcement actions, monitored pre-insolvency transfers of accounts, and reviewed the execution of margin practices at several exchanges. This activity required approximately six staff-years.

-- Supported the investigation and preparation of the Division's special report on the failure of Volume Investors Corp., providing financial analysis of the surrounding events and an assessment of possible violations of the minimum financial and segregation requirements of the Commodity Exchange Act and Commission regulations. This report included a review of financial audit and market surveillance functions at each of 13 SROs (a "horizontal" review) and also focused on how existing audit programs address firm approaches to risk management. This review was in response to a problem situation in the options pilot program which itself was designed to test the sufficiency of the Commission's option regulatory program with a view to improvements and refinements. This required one staff-year.

-- Completed initial audits under the Commission's program to register three Leverage Transaction Merchants to ascertain their compliance with the Commission's minimum financial requirements. This activity required approximately two staff-years.

The staff also completed certain special projects. These required approximately four staff-years:

-- Revised and reissued a Financial and Segregation Interpretation which provides guidance to commodity SROs as to how their audit and financial surveillance programs should be structured.

-- Reached agreement with the Commodity SROs' Joint Audit Committee ("JAC") on amendments to the JAC's uniform audit program to incorporate audit steps to verify member-FCMs' compliance with the Commission's segregation rules. This uniform audit program will be used by all the commodity SROs in their audits of member-FCMs.

-- Prepared a rule proposal to strengthen the Commission's minimum financial requirements by providing a charge for concentrated positions, such that additional capital is required in cases where a firm is carrying excessive concentrations.

-- Prepared proposed rules to strengthen the regulatory requirements affecting the use of repurchase agreements and reverse-repurchase agreements by registrants.

-- Supported the completion of a major enforcement investigation.

-- Initiated periodic meetings with the staff of the Securities and Exchange Commission to discuss and initiate resolution of financial rule interpretation issues of mutual concern.

-- Completed an extensive letter requesting confirmation of FDIC treatment of margin funds held through a clearing organization by a failed bank.

-- Prepared an advance notice of proposed rulemaking concerning the liquidation and transfer of customer accounts.

Planned Activities (FY 1986)

In FY 1986, the subprogram plans to focus on financial reviews and to add particularized reviews of clearing organizations to the review of contract market programs. Execution and production of these reviews will require 24 staff-years for FY 1986 as follows:

-- The subprogram oversight work will be performed for all the SROs with selected SROs subject to an annual formal review achieved through the execution of a quarterly schedule of oversight activities. The staff plans to issue eight financial rule reviews under this oversight program.

-- The reviews will include oversight field audit work at about ten percent of the number of member-FCMs for which each SRO has audit responsibility, or approximately 40 FCMs. Also, oversight field audit work will be performed upon approximately 20 commodity pools which are audited solely by the NFA.

-- The subprogram's oversight reviews, in addition to routinely covering all functional areas of the SRO programs, will concentrate upon monitoring compliance with revised Division Financial and Segregation Interpretation Number 4-1. In this revised interpretation, monitoring of SRO surveillance over high-risk positions, compliance with the Commission's segregation requirements and FCM risk management of customer accounts is emphasized.

-- In response to recent events, oversight reviews will be expanded to include the operations of clearing organizations, particularly with regard to surveillance and options margining systems.

-- An oversight review manual to guide the staff in conducting this type of work is also planned.

Interpretations and special projects will require six staff-years and will be focused as follows:

-- Completion of development and implementation of the proposed capital concentration provision.

-- Transformation and consolidation of the Division's financial interpretative letters and Commodity Exchange Authority Administrative Determinations into a new series to provide financial interpretative guidance to the FCM community.

-- Cooperation with the AICPA in the further development of an audit guide to provide guidance to the independent certified public accountants who audit FCMs.

The subprogram's audit program for the leverage transaction merchants authorized under the moratoria will continue with annual audits and reviews of periodic financial statements. This activity will require two staff-years for FY 1986. This area is especially staff intensive because the Commission has exclusive direct audit responsibility and because the audits are complex and require confirmation of cover at several locations.

Enforcement support will also continue with respect to several major cases which require accounting expertise. A particular focus of financial oversight in addition to improving SRO compliance programs is the development of referrals to the Commission's Division of Enforcement or the affected SROs, as appropriate. Subprogram auditors develop workpapers which document the referral and help to support requests for orders of investigation. Auditors also participate in developing questions for the taking of testimony and provide expert accounting assistance and testimony. This activity will require nine staff-years for FY 1986.

Planned Activities at Current Level (FY 1987)

The subprogram plans to continue performing its oversight function which focuses on the audit and financial surveillance programs of SROs. As in FY 1986, the subprogram's oversight responsibilities will extend to the SRO's member-FCMs to assure that SRO financial rules designed to ensure the financial stability of member-FCMs and the safety of customer funds, are affirmatively enforced during the execution of the SRO's programs. Twenty-eight staff-years will be required to conduct financial rule enforcement reviews of the SROs. Included in the financial rule enforcement reviews of the SROs, will be a continuation of the horizontal rule review activity whereby the same issues of concern are examined at a number of exchanges and/or clearing organizations. Also, the subprogram will include more intensive monitoring of clearing organization activity.

It is expected that oversight work will be performed for all the SROs with selected SROs subject to an annual formal review achieved through the execution of a quarterly schedule of oversight activities. The staff plans to issue eight financial rule reviews under this approach. However, this plan does not take into consideration the occurrence of financial emergency situations that require the immediate attention of the subprogram staff. The financial rule reviews will include oversight field work at about ten percent of the number of member-FCMs for which each SRO has audit and financial surveillance responsibility, or about forty FCMs. Additionally, approximately twenty commodity pools which are audited solely by the NFA will be targeted in the subprogram's oversight field audit work.

In addition to the Financial Audit and Review Unit's primary oversight mission, the unit will direct its remaining thirteen staff-years to providing interpretations, conducting special projects, developing and supporting enforcement cases, conducting aulits of leverage transaction merchants, and performing audits of registrants in situations involving financial emergencies. Interpretations of the Commission's financial rule requirements and special projects similar in complexity to the proposed capital concentration rule changes will require six staff-years. Five staff-years will be devoted to the development and support of enforcement cases to include providing expert testimony in enforcement proceedings. Two staff-years will be required to perform audits of leverage transaction merchants for which the Commission has direct regulatory responsibility.

ADMINISTRATIVE SUPPORT SERVICES

The Office of the Executive Director provides Administrative Support Services for the entire agency. Services provided include personnel, budget analysis, fiscal management, library support, internal audit and evaluation, administrative services and automated data processing. In addition, the Office of the Executive Director coordinates short- and long-range planning for the Commission.

Resource Changes (FY 1987)

The Commission estimates that an increase of $839,000 is required to adequately provide administrative support services to the agency in FY 1987. The increase includes the costs related to two additional staff-years and a share of the Commission's anticipated increase in operating expenses for FY 1987. Total request for FY 1987: $6,184,000.

	FY 1985 Actual	FY 1986 Estimate	FY 1987 Request
Staff-Years (FTE):			
Funded	86	80	82
Obligations (000):			
Comp/Benefits	$2,839	$2,746	$2,831
Other (Direct)	2,025	1,763	2,354
Other (Pro rata)	904	836	999
Total	$5,768	$5,345	$6,184

Accomplishments (FY 1985)

During FY 1985, the Office of the Executive Director focused on long range planning, both in developing a five-year ADP plan and in developing a long-term strategic plan for the Commission. Because of the Commission's emphasis on ADP support, a separate section on ADP follows. It should be noted that while ADP is included in the Administrative Support Services budget above, details of the ADP budget are displayed in Appendix A.

During FY 1985, the Personnel Section completed approximately 1200 personnel actions. Hiring involved evaluating the large volume of applications received in response to vacancy announcements, as well as responding to 2900 summer applicants and over 300 unsolicited applications. In addition to its day-to-day operations, the Section completed union negotiations and issued the Merit Promotion Plan, began implementation of the Performance Management and Recognition System legislation, completed EEO and personnel management training for supervisors and managers, and improved the use of

PERMITS, the Air Force's personnel information system which CFTC shares.

The Library, in FY 1985, completed over 1,000 interlibrary loans, answered 6,000 research and reference questions and generated 10,000 catalog cards to be filed. Most of the research and interlibrary loan activity of the library supported the Division of Enforcement and General Counsel's Office in conducting litigation. Outdated or unneeded material was weeded from the shelves.

The Administrative Services Section completed a number of major projects in addition to its usual responsibilities for procurement, mail, and space management. The staff reviewed about 115,000 registration files in the Chicago Office, transferred 78,000 active files to the National Futures Association, and moved most of the remaining records off-site. The staff also implemented new Federal Acquisition Regulations, completed a survey of long-term space requirements, identified and disconnected 90 unused telephone lines, and completed negotiation of a new lease for the headquarters office.

In FY 1985, the Operations and Budget Section focused on improvements to reporting on the obligation status of the operating budget. Improved analyses resulted from the streamlining of accounting operations and the acquisition of a microcomputer. A new accounting processing system was developed for obligating documents, the obligation document was redesigned to display transaction history, and a series of internal reports were developed. Additionally, sampling techniques were incorporated into the examination process for travel vouchers. Studies were initiated to determine the feasibility of using a travel agent and the Diner's Club System to improve efficiency of the travel function.

The Audit and Evaluation Section conducted a number of reviews, surveys and inspections in FY 1985. In addition to routine audits, the Section evaluated personnel procedures to insure efficient and effective use of limited staff resources, reviewed the reparations program to document the experience in the first year of operating under the new reparations rules and to propose improvements in efficiency and control, established guidelines for collecting service fees, and reviewed the status of funds information and recommended improvements in briefings and reports prepared by the Budget Office. The staff also reviewed voucher filing and payment procedures and recommended improvements in scheduling bills for payment in accordance with OMB cash management guidelines. Finally, the Audit and Evaluation staff took lead responsibility for monitoring CFTC's implementation of OMB Circulars A-123 and A-127 and the Federal Manager's Financial Integrity Act.

Planned Activities (FY 1986)

During FY 1986, the staff of the Office of the Executive Director will continue long- and short-range planning efforts, since these tools become even more important during periods of reduced resources.

During FY 1986, the highest priority of the Personnel Section will be to insure that the Commission is fully staffed with qualified personnel. The staff will also focus on maintenance of the PERMITS system in order to ensure an accurate record of CFTC personnel for both management and payroll purposes. Routine external requirements will continue to be met. However, the Section will have difficulty implementing any major new legislation or regulations (e.g., performance management for GM and GS employees or any civil service retirement system changes), responding to external and internal requests for information, keeping records, and assisting managers with problems of realignment of work stemming from the FY 1986 reduced staffing levels.

Since the creation of the Commission in 1975, the Library has had at least four full time employees. At the FY 1986 level, the Library will have only three employees. As a result, the staff will have to focus on the ordering, receipt, processing, shelving and updating of library materials at the expense of circulating periodicals, cataloging and providing research assistance to the Commission's ongoing litigation or other programs.

During FY 1986, the Administrative Services Section will be decreased from 21 to 18 staff-years. At this level, only mandatory procurement, space management and equipment management functions will be performed. Services such as delivery and printing will be slowed, and special studies, such as a review of the telephone system, analysis of space requirements and updating of forms and policy directives will not be performed. A study will be made of the Commission's use of the U.S. Mails and commercial mail services in order to reduce postage and mailing costs. Work will continue in the development of an automated procurement system which will provide the procurement staff with a timely management information system.

The Operations and Budget staff plans to expand its use of microcomputers during FY 1986. Budget execution applications will be further automated to reduce the burdensome recordkeeping and data compiling now done manually. Effective January 1, 1986, a travel agent was hired to facilitate Commission travel. To the extent that the workload allows, accounting operations will be refined and documentation improved. New automated financial system integration projects will be reviewed as required by OMB in Circular A-127. The staff will continue to operate the civil penalties collection program in concert with the Division of Enforcement. In recognition of the growing accounting and reporting workload, a secretarial position was added in FY 1986, increasing the Operations and Budget staff from nine to 10 staff-years.

In FY 1986, the Audit and Evaluation staff will be reduced from four staff-years to two staff-years. At this level, the Section will audit the CFTC fiscal systems and monitor the CFTC's conduct of mandatory internal control reviews. No evaluations of operational programs for effectiveness and efficiency will be conducted and no assessments of procedures or resource requirements will be accomplished.

Impact of Current Level (FY 1987)

Personnel Section activities will continue to be critically curtailed in FY 1987. At the reduced staffing level, emphasis will be placed on assuring maintenance of the automated personnel system, providing basic

advice and service to managers, responding to external reporting requirements, and continuing implementation of the new performance management regulations.

At the current level, there are many services which the Library will not be able to provide. In particular, placing a limit on interlibrary loans and reducing research support could have a significant impact on the ability of the professional staff of the Commission to perform their functions.

In FY 1987, the Administrative Services Section will be limited to performing only the highest priority tasks, such as procurement, duplication, and space and equipment management.

At the current level, the Operations and Budget staff will continue to focus on ways to automate data collection and reporting activities in the context of an increasing workload. As resources allow, the staff will pursue the financial mangement goals of OMB Circular A-127 and Treasury cash management initiatives.

Continuation of the FY 1986 staffing level of the Audit and Evaluation staff in FY 1987 will leave the Commission's programs unaudited for two years in a row. The Commission will not have the ability to conduct internal audits to verify that its funds are being expended in accordance with the objectives it sets or that its programs are being operated in an effective and efficient manner. The Commission will have to rely on individual managers to perform reviews of their own programs. With only two staff-years, the staff will only be able to perform audits of the Commission's fiscal systems and monitor the conduct of internal control reviews.

Justification of the Request (FY 1987)

The Library is requesting an additional staff-year to restore it to its FY 1985 level of four. The additional staff-year would provide for research assistance which is mandatory for enforcement and appellate litigation. Therefore, if library staff cannot provide this support, the attorneys themselves will have to divert valuable time away from their cases to perform these research tasks.

The addition of a program analyst to the Audit and Evaluation staff will result in a staff of three, which is one less staff-year than the FY 1985 level. However, at this level, Audit and Evaluation will be able to conduct reviews and evaluations of CFTC's administrative and operational programs in order to find ways to use resources more effectively and to develop improvements in productivity. The Commission feels that internal reviews of programs are important to improving the efficiency of operations and preventing waste, fraud and abuse, particularly in a restricted budget environment.

Automated Data Processing

Introduction

The Automated Data Processing program provides critical support to Market Surveillance, Market Research, Enforcement, Registration, Audits, Contract Markets, Reparations and Administrative Support Services.

Accomplishments (FY 1985)

During FY 1985 the Commission's ADP Services Section accomplished goals in five major areas: long range planning, database management system installation, development of new application systems, creation of an Information Center, and improvement of data center operations.

A Five Year Strategic ADP and Data Communications Plan was completed by the Office of the Executive Director with assistance from ADP Services and approved by the ADP Steering Committee. This plan, required by OMB and requested by the House Appropriations Committee and GAO, examines present and future workloads, system needs and development priorities, data volumes and processing frequencies anticipated over a five-year period starting in FY 1986. It also establishes strategies in the areas of telecommunications, software management alternatives to in-house software, end user computing, information management and electronic filing as required by OMB Bulletin 85-12. The result of creating the plan is to delineate needs for ADP systems, staff and computing capability through FY 1990, and set forth a definitive long range direction for information processing at the Commission.

Installation of a database management system, data dictionary and associated fourth generation programming language, a second major accomplishment, provides an important set of tools to complete the current and anticipated system development activities. The database tools not only allow more efficient and effective design and programming, optimizing the use of system development staff, but also allow development of interactive systems to make data accessible to program staff without the delays associated with overnight batch processing systems.

Major accomplishments in system development activities include some that already make use of the database management system. Major components of the Integrated Market Information System were completed using the database management system. Component systems completed include the Exchange Data Subsystem with online editor, Contract Critical Dates Subsystem, Member Identification Subsystem, user specific menu selections and data security parameters. Under development and expected to be completed in FY 1986 are

Options Monthend Reporting, Options Clearing Member, Options Permanent Records and Options Large Trader, modifications to the Special Accounts Subsystem to make possible development of the Options Large Trader System, and conversion of the Cash Prices System to more thoroughly integrate it with the other market information subsystems.

The Special Investigations System to assist in reviewing trading records for trade practice investigations was completed. A common format for exchange data to provide similar reports from data supplied by different exchanges was developed and a number of retrieval programs developed to use that Exchange Database format. These programs assisted seven trade practice investigations in FY 1985.

In December 1984, the ADP Services Section worked with the Division of Trading Markets to complete the transfer of registration information to the National Futures Association. At the same time the Section designed, developed and completed conversion of floor broker and leverage transaction merchant registration information to a new system on the Commission's Zilog multiuser microcomputer.

Analysis of available technologies to support the Commission's proposal for reconstruction of trades was conducted and a demonstration given showing Commissioners relevant technological devices. Analyses of capabilities needed in an agencywide Case Tracking System and a Financial Management System have begun and will continue into FY 1986.

An Information Center in the Washington Headquarters office, equipped with microcomputers, printers, and software was opened during FY 1985. The Center is designed to foster end user computing and place computers directly in the hands of Commission professionals. The volume of data processed by most Commission units has increased and has overloaded manual systems. The overload has caused these units to seek automated systems, since the Commission has not been able to maintain a parallel growth in staff. ADP Services, already facing a considerable backlog of needed systems, chose to provide a microcomputer-based center, train and provide assistance to units to be more self-sufficient in supporting their needs for new systems. To that end, training courses were conducted to teach end users how to develop simple applications. Thirty professional staff in the Headquarters office were trained to design and develop their own systems on microcomputers. In addition, ADP staff were and continue to be available in the headquarters center to assist users.

Finally, accomplishments resulting in greater operational efficiencies in computer center operations were completed including performance measurement analysis, system tuning, and capacity planning. A new front end telecommunications processor was installed to improve or decrease terminal response time and increase remote printer speeds. Two additional strings of disk drives, acquired at no cost to the government through the GSA Excess Equipment program, were installed providing more online storage space needed for database operations.

Planned Activities (FY 1986)

ADP activities in FY 1986 will center on the implementation of the first year of the Five Year Strategic ADP and Data Communications Plan. The focus of attention will be development of those new software systems prioritized and approved by the ADP Steering Committee for FY 1986. Systems to be developed included in the Plan are only those that are not available from commercial sources. FY 1986 projects scheduled for completion are major portions of the online database system for options market surveillance, various components leading toward an Integrated Financial Management System to comply with OMB Circular A-127 and continuation of the study and implementation of a system for tracking of enforcement, reparations and legal cases Commissionwide.

Expansion of the Information Center concept to include regional offices in New York and Chicago will be a second major goal. These regional centers will be designed like the headquarters center to promote the use of computers by non-ADP professionals. Activities to establish the centers will include installation of hardware and software; initial training and establishment of an ongoing training program; providing assistance to professionals in selecting appropriate tools, designing, developing and debugging early applications; investigation and analysis of new products and continuing education on their use.

As projected in the plan, ADP will replace the current mainframe computer in the Chicago Data Center. This replacement is based on sizing studies done as part of the process of developing the long-range plan. The Commission has found it will be able to upgrade to a new, larger computer at costs similar to that of maintaining the AS-5000 and AS-5 computers now owned, using a lease-to-purchase contract. This can be accomplished without an increase in funding. The replacement of the computer is consistent with Grace Committee recommendations for replacement of outdated computing equipment and with OMB/GSA directives on technology updates contained in the Federal Information Resources Management Temporary Regulations (FIRMR). This acquisition is essential to provide the necessary capacity and reliability to make operational the newly developed systems to be completed in FY 1986.

Installation of the new computer and database management software, increased demand for telecommunications assistance associated with placing more users online, and staff needed to implement the regional Information Centers will force existing staff to meet demands associated with these activities. This move to a state-of-the-art computing environment and the attendant resource requirements will slow systems development productivity in FY 1986 because staff previously assigned to develop systems will be performing these new functions.

Planned Activities at Current Level (FY 1987)

In FY 1987 the mainframe systems applications developed in FY 1986 will become operational and will require some increase in the staff time spent on systems maintenance, especially in the areas of terminal user support, telecommunications and database management.

More end user computing both through use of the Information Centers and the main computer through interactive terminals, will allow ADP Services to assign its limited systems development personnel resources to the larger development projects outlined in the five-year ADP plan while end users meet some of their less complex needs through use of the Information Centers and off-the-shelf software, promoting greater productivity throughout the Commission.

Projects planned for FY 1987, pending ADP Steering Committee review, include conversion to the database management system the portion of the Integrated Market Surveillance System for recording futures prices, volume and open interest; modification of software processing each exchange's data for incorporating the requirement to record timing of trades to the nearest minute as each exchange changes their format; implementation of additional portions of the Financial Management System; continuation of the Commissionwide Case Tracking System development; enforcement, reparations and legal history recordation systems; document indexing and tracking applications; and beginning of conversion to database of the market surveillance system for daily activity of the largest traders in each futures market.

Some of these applications may take longer than originally planned because increased maintenance activities will reduce staff time available for new projects. Contractor support will be continued. The Commission plans to meet a portion of the application development requirements considered to be nonpermanent by using contractors because it believes that, over time, the requirements for new systems will level off or be reduced. This is consistent with OMB guidelines for contracting out. It also increases the government's flexibility in creating the skill mix necessary for projects of limited duration by writing contractor tasks to suit the skills required for the extent of the need only. This allows greater ability to hire specific talent when needed and release that talent when the project is completed, obtaining more appropriately-skilled personnel for the next project which may require talent or experience of a different type.

In addition, the funds requested include a full year's lease of the new central processing unit to be installed in FY 1986, lease of the MVS/XA operating system, and increased costs charged by the Department of Treasury for operation of the payroll/personnel system. A new printer to replace the ten-year old unit serving as the main printer for the mainframe computer, new terminals and printers for the expanding user community and additional microcomputers to further implement the regional Information Centers are also requested.

PROCEEDINGS

The Proceedings program is operated by the Commission's Office of Proceedings which is under the administrative direction of the Office of the Executive Director. The Office of Proceedings is divided into two sections: the Complaints Section and the Hearings Section. The Complaints Section receives customer claims against persons or firms registered under the Commodity Exchange Act, prepares claims for forwarding to the Hearings Section and dismisses claims which are clearly outside the Commission's jurisdiction or which are pending in another forum. The Hearings Section decides customer claims in voluntary and summary proceedings, which are heard by judgment officers, and in formal proceedings before administrative law judges. The Hearings Section also hears enforcement cases brought by the Commission against persons or firms who have violated the Commodity Exchange Act or the Commission's rules and regulations.

Resource Changes (FY 1987)

The Commission estimates that an increase of $87,000 is required to maintain the FY 1986 staffing level of the Proceedings program in FY 1987. The increase includes a share of the Commission's anticipated increase in operating costs for FY 1987. Total request for FY 1987: $1,643,000

	FY 1985 Actual	FY 1986 Estimate	FY 1987 Request
Staff-Years (FTE):			
Funded	30	29	29
Obligations (000):			
Comp/Benefits	$1,072	$1,101	$1,116
Other (Direct)	112	153	164
Other (Pro rata)	315	302	363
Total	$1,499	$1,556	$1,643

Accomplishments (FY 1985)

The Futures Trading Act of 1982, which became effective January 11, 1983, altered the Reparations program by limiting the complaints which the Commission could hear in reparations to cases against persons or firms registered with the Commission at the time the alleged illegal activity took place. In addition, the 1982 Act allowed the Commission to promulgate rules to streamline the reparations process.

On April 23, 1984, new reparations rules became effective. The new rules require the Complaints Section to dismiss without prejudice complaints which are in the process of being heard in arbitration forums or in civil litigation and complaints against respondents who are in receivership or bankruptcy proceedings. These cases were formerly forwarded to the administrative law judges' dockets where they were stayed pending the outcome of other actions. The new rules also create a voluntary decisional procedure in which a complainant can obtain a non-appealable, brief decision by a judgment officer based on written submissions by the parties. The rules also raise the ceiling on summary proceedings, which are decided by judgment officers, from $5,000 to $10,000. In addition, the rules established a proceedings officer to oversee the initial discovery process in formal proceedings so that the administrative law judges can make decisions on the merits of a reparations case more expeditiously.

The number of complaints received by the Complaints Section in FY 1985 was 454. Twenty-one additional cases were reinstated. The number of complaints dismissed totaled 132 in FY 1985 compared to 256 in FY 1984. Fewer complaints were dismissed because of a more effective pre-filing education process which includes sending brochures and complaint forms and responding to telephone and written inquiries. These inquiries allow the potential complainant to determine prior to filing a complaint whether the firm or individual involved is registered with the Commission. During FY 1985 the Office of Proceedings responded to about 6400 phone calls and 800 written inquiries, and sent out about 1700 reparations brochures.

The Complaints Section forwarded a total of 414 complaints for voluntary, summary or formal adjudication during FY 1985, an increase of 128 cases over FY 1984. The Complaints Section ended FY 1985 with a workload of 196 complaints, a decrease of 71 from FY 1984.

During FY 1985, the Hearings Section rendered initial decisions on the merits in 241 reparations cases. In addition, 63 reparations cases were dismissed for cause, 181 were settled and 63 were defaulted. At this rate of disposition, the Hearings Section was able to reduce its reparations backlog from 601 cases at the beginning of FY 1985 to 552 cases by the end of FY 1985 even with an increased input of 128 cases from the previous year. These statistics indicate that the Office of Proceedings continues to make great progress in meeting its goal of adjudicating customer claims in a timely and efficient manner.

With regard to enforcement cases, the Hearings Section began FY 1985 with a workload of 62 administrative actions. A total of 67 actions were filed during FY 1985. Of the 129 enforcement cases on the administrative law judges' dockets during FY 1985, 35 were settled, 38 decisions were issued and 56 actions were carried forward into FY 1986.

Planned Activities (FY 1986)

During FY 1986, the Office of Proceedings will fund 29 staff-years, a decrease of one staff-year from its funded FY 1985 level. The reparations workload in the Complaints Section is expected to increase because of the substantial increase in inquiries from the public. Given the rate of inquiries over the last few months, the Complaints Section expects to receive 7400 telephone inquiries and 1000 written inquiries, and to send out about 1700 reparations brochures.

It is expected that the number of complaints received will be about 500 in FY 1986. The projected level of 500 customer complaints assumes that there will be no market crises resulting in an unexpected increase in the number of complaints received. In addition, this projection assumes the number of complaints filed by leverage customers will be about 60 cases, which is based on the fact that leverage complaints have averaged about 20 complaints per leverage firm over the last three years.

The Hearings Section will continue to reduce its backlog of pending reparations cases during FY 1986. The Hearings Section expects to have 492 reparations cases pending at the end of FY 1986, a decrease of 60 cases from the number pending at the end of FY 1985.

At the beginning of FY 1986 the Hearings Section had a workload of 56 administrative enforcement actions. It is estimated that 60 enforcement actions will be filed during FY 1986 creating a total workload of 116 cases. The Hearings Section will be able to dispose of 60 cases, resulting in 56 cases being carried forward into FY 1987.

Planned Activities at Current Level (FY 1987)

The Commission has taken positive steps to make an alternative, quick forum available for resolution of customer complaints and has undertaken to improve the speed of the current decisionmaking process as well. The current level will enable the staff to keep pace with the expected FY 1987 workload unless some unforeseen market crisis causes a dramatic rise in the number of complaints or enforcement cases.

LEGAL COUNSEL

The Legal Counsel program, operated by the Office of General Counsel, provides the Commission, the individual Commissioners, and the Commission's operating divisions with legal services in support of agency objectives. These services include defensive and appellate litigation, opinion writing, legal support for the Commission's programs, regulation drafting, and legal advice and analysis.

Resource Changes (FY 1987)

The Commission estimates that an increase of $122,000 is required for the Legal Counsel program in FY 1987. The increase includes the costs related to one additional staff-year and a share of the Commission's increase in operating expenses for FY 1987. Total request for FY 1987: $2,199,000.

	FY 1985 Actual	FY 1986 Estimate	FY 1987 Request
Staff-Years (FTE):			
Funded	34	32	33
Obligations (000):			
Comp/Benefits	$1,582	$1,671	$1,717
Other (Direct)	41	73	82
Other (Pro Rata)	357	333	400
Total	$1,980	$2,077	$2,199

Accomplishments (FY 1985)

Litigation. During FY 1985, litigation involving the Legal Counsel staff, including appellate, district court, and administrative litigation, increased by more than 26 percent over FY 1984. This increase came on top of an increase of more than 45 percent from FY 1983 to FY 1984. In FY 1985, the Legal Counsel staff handled 181 cases on behalf of the Commission, as compared with 143 cases in FY 1984 and 98 cases in FY 1983. This translates to approximately 20 cases per litigating attorney in FY 1985, in contrast to approximately 10 cases per attorney in FY 1983.

Of particular note in FY 1985 was the amount of time that the Legal Counsel staff devoted to very labor-intensive United States Supreme Court litigation. The Commission won a major victory in CFTC v. Weintraub, No. 84-261 (U.S. April 29, 1985), a Commission enforcement case where the Supreme Court, reversing the United States Court of Appeals for the Seventh Circuit, held 8-0 that a bankruptcy trustee for a commodity broker controls the firm's attorney-client privilege. The Legal Counsel staff devoted approximately 800 staff-hours to this case in FY 1985. It spent at least

an additional 1,200 hours seeking approval for and drafting petitions for certiorari in Schor v. CFTC, Nos. 84-1500 and 84-1519 (U.S.), vacated and remanded, 105 S.Ct. 3551 (1985), reinstated, (Aug. 13, 1985 D.C. Cir.), cert. granted, No. 85-621 (U.S. Dec. 9, 1985). The staff also opposed two petitions for certiorari in Legal Counsel cases before the Supreme Court.

The increase in litigation during FY 1985 was spread throughout the spectrum of cases involving the Legal Counsel. One area showing a particularly large increase was administrative litigation involving Freedom of Information Act and Confidential Treatment Request appeals to the Commission. These cases rose in number from 19 in FY 1984 to 36 in FY 1985, an increase of more than 89 percent. In one of these cases alone, the Legal Counsel staff, anticipating a district court challenge, spent over 360 hours.

Another area of increased litigation activity was petitions for Court of Appeals review of Commission reparations decisions. Legal Counsel handled 25 of these cases in FY 1985, as compared with 15 in FY 1984, an increase of 66 percent.

Subpoena defense work also increased in FY 1985. Legal Counsel staff opposed or sought to narrow the scope of subpoenas served on the Commission in 26 private litigation matters in FY 1985, as compared with 22 matters in FY 1984. The staff generally seeks to avoid the release of information that could impair Commission investigations or enforcement efforts.

The number of instances in which Legal Counsel staff was required to defend challenges to Commission regulations and interpretations in FY 1985 remained at 10, the FY 1984 level. These cases are among the most time-consuming for the Legal Counsel staff, since they require the compilation of extensive legislative histories and the preparation of persuasive pleadings on complex economic and legal issues.

The Legal Counsel's enforcement-related litigation numbered 34 cases in FY 1985. These cases include petitions for review of Commission enforcement orders, appeals from Commission injunctive actions, and collateral attacks on Commission enforcement proceedings.

Bankruptcy proceedings also accounted for the increase in Legal Counsel's litigation work load during FY 1985. Pursuant to a specific provision of the Bankruptcy Code, Legal Counsel staff appeared on behalf of the Commission in 23 district court bankruptcy proceedings and one appellate bankruptcy proceeding involving commodity brokers during FY 1985. This represents an increase of more than 26 percent over the 19 bankruptcy proceedings in which Legal Counsel staff participated during FY 1984. In these cases, Legal Counsel staff assisted trustees and the courts to make sure that customers' funds were treated in a manner consistent with the Bankruptcy Code.

Legal Counsel staff also increased its amicus curiae ("friend of the court") litigation during FY 1985, participating in 12 cases, as compared with nine in the previous year. In amicus cases, the staff represents the

Commission in private litigation, often at the request of a state or federal court. The Legal Counsel staff assists the courts in resolving difficult or novel questions arising under the Commodity Exchange Act, frequently making a significant contribution to the development of consistent and accurate legal precedent.

During FY 1985, the Legal Counsel was involved in other types of litigation, as well. The staff represented the Commission in actions brought under the Equal Access to Justice Act, in matters concerning employment practices, in "Bivens" actions where Commission employees are accused of violating plaintiffs' Constitutional rights, and in contractual disputes.

Notwithstanding the relatively high volume of litigation handled by the Legal Counsel staff, the Commission won significant victories in an overwhelming majority of its cases decided during FY 1985.

Opinions. The Legal Counsel staff manages the Commission's appellate docket by drafting opinions and orders in reparations and enforcement cases. The staff works closely with the Commissioners and their legal assistants to develop substantive policies and efficient procedures for handling the Commission's large administrative case load.

During FY 1984, the Legal Counsel substantially increased its resource commitment to Opinions Section work, resulting in an increase in Commission reparations decisions from 108 in FY 1983 to 168 in FY 1984. This increased work level continued in FY 1985, with 173 final reparations orders issued. As a result, the backlog of reparations cases on the Commission's appellate docket has declined from 177 at the start of FY 1984 to 135 at the start of FY 1985 and 101 at the end of FY 1985.

The Opinions Section has continued to draft decisions in administrative enforcement cases as well. During FY 1985, the staff issued 16 final enforcement orders, including seven major opinions. Frequently, these cases involve enormous administrative records and require substantial amounts of staff time. One major enforcement case alone required over 800 hours of staff time during FY 1985.

Legal Advisor. The Legal Counsel is the chief legal advisor to the Commission. In this role, the Legal Counsel participates in the formulation of the Commission's regulatory policy, preparing advisory memoranda to brief the Commission on legal issues relating to regulatory initiatives, legislative proposals, and statutory interpretations. The staff reviews documents prepared for the Commission by other divisions to ensure consistency with statutory requirements, Commission precedents, and legal developments. In addition, the staff responds to requests for legal analysis and advice from individual Commissioners and program managers. The staff also answers public inquiries concerning the Commission's statutory responsibilities and offers legal interpretations to other federal and state agencies with related regulatory interests.

The Legal Counsel staff provides support to the enforcement program by

performing legal analyses and drafting background memoranda concerning major enforcement actions. Often, the staff furnishes legal research assistance that goes well beyond a simple reviewing function. During FY 1985, the Legal Counsel reviewed 162 proposed enforcement actions, an increase of more than 6 percent from the corresponding FY 1984 figures of 152. One extraordinarily complex enforcement review required over 480 hours of Legal Counsel staff time during FY 1985.

The Legal Counsel also reviews all applications for contract market designation and proposed contract market rule changes. During FY 1985, one designation review consumed over 200 hours of staff time. In addition, the staff devoted considerable time to reviewing applications from two new commodity exchanges. The Legal Counsel staff reviewed 133 proposed rule changes in FY 1985, a 16 percent increase from the 114 rule changes reviewed in FY 1984.

All proposed Commission regulatory initiatives are reviewed by the Legal Counsel staff. In addition, the staff assumes primary responsibility for many proposed Commission rule changes. During FY 1985, the staff drafted proposed and final rule changes concerning the collection of civil monetary penalties, the disclosure of information by present and former Commission employees, requests for Commission records under the Freedom of Information Act, petitions for confidential treatment of information submitted to the Commission, and fees to be charged for public services rendered by the Commission.

In the legislative area, the Legal Counsel staff continued in FY 1985 to devote substantial resources toward analyzing and implementing the provisions of the Futures Trading Act of 1982. At the same time, the staff began analyzing legal issues and studying possible legislative changes that may be proposed during the FY 1986 reauthorization process. The staff worked closely with the North American Securities Administrators Association to develop a model state commodities code for use in combatting fraudulent commodities-related sales schemes. The model code was adopted by NASAA in April 1985.

As usual, the range of issues on which the Legal Counsel staff was asked to provide legal advice was quite broad in FY 1985. Advice was furnished on topics as diverse as the rules and actions of the National Futures Association, Commission contractual and procurement requirements, emergency management procedures, internal controls, and various personnel matters. The staff also supervised the Commission's compliance with the Privacy Act, the Government in the Sunshine Act, the Paperwork Reduction Act, the Federal Advisory Committee Act, the Equal Access to Justice Act, and the Budget and Accounting Procedures Act.

Planned Activities (FY 1986)

The Legal Counsel anticipates several areas of increased activity during FY 1986. Based on recent trends in incoming litigation matters, the Legal Counsel expects that in FY 1986 its litigation case load will remain virtually constant at the historically very high FY 1985 level. Moreover, labor-intensive

59-751 O—86——6

appellate litigation is apt to show an increase. With the single exception of amicus cases, the Legal Counsel's litigation is mandatory. Even the Legal Counsel's amicus participation is often of an essential character, either because the Commission desires to clarify important aspects of commodities law and thereby forestall future litigation or because the court has requested Commission amicus participation.

Three areas of legal advisory work are expected to rise notably during FY 1986. Historically, the Legal Counsel staff spends at least two extra staff-years on legislative matters during a reauthorization year. FY 1986 is expected to be no exception. During this period of time, many demands are placed upon the Legal Counsel staff above and beyond its continuing regulatory functions. Based on past experience, reauthorization demands quick, accurate responses to inquiries that often involve complex legal analysis. In addition, many state legislatures are expected to consider the new model state commodities code during FY 1986. This will undoubtedly result in an increased number of state requests for legal advice and interpretations from the Legal Counsel staff. Finally, an increase in legal advisory work related to the National Futures Association is anticipated. In particular, the staff expects to be confronted with numerous issues relating to NFA registration and enforcement actions.

This increase in mandatory Legal Counsel work will come in a year when the Legal Counsel's funded staffing level has been reduced by 6 percent, from 34 in FY 1985 to 32 in FY 1986. Even in FY 1985, the Legal Counsel experienced a major strain on its resources. In that year, its workload increased significantly, particularly in the litigation and opinions areas, without any increase in staffing. The continued increase in Legal Counsel responsibilities in FY 1986, when coupled with a reduced staffing level, will prevent the Legal Counsel from responding in all areas with the timeliness and thoroughness that it has exhibited in the past.

One obvious area where the Legal Counsel will be forced to curtail its efforts is in the Opinions Section. The Legal Counsel estimates that with a FY 1986 staffing level of 32, it will be able to complete only 125 opinions, a decrease of one-third from FY 1985. This will reverse the progress that the Opinions Section achieved in reducing the backlog of reparations appeals during FY 1985.

The Legal Counsel will, of course, attempt to streamline its operations wherever possible without sacrificing the speed, accuracy, or completeness of its responses. Nevertheless, there are limits to the number of additional cost-saving measures that can be taken without producing a negative impact upon the Legal Counsel's major responsibilities.

Impact of Current Level (FY 1987)

At a staffing level of 32, the Legal Counsel would continue to experience severe resource problems in FY 1987. While it is difficult to predict litigation

statistics more than one year in advance, the staff anticipates that litigation will remain about constant in FY 1987, at a projected level of 181 cases. This figure represents nearly a 100 percent increase in Legal Counsel litigation from FY 1983.

Many enforcement and reparations cases that are currently being handled by other Commission programs will result in Legal Counsel litigation by FY 1987. In addition, the increasing level of private commodities actions brought pursuant to Section 22 of the Commodity Exchange Act, which specifically allows private actions to be brought for violations of the Act, will guarantee a continued high level of subpoena defense and court-requested amicus work for the Legal Counsel. It would be difficult for the Legal Counsel to maintain its previous successful record in litigating these types of cases with a staffing level of 32.

Since there is almost no flexibility in the litigation area, and only limited flexibility in the regulatory area, the Opinions Section work would be most affected by the current staffing level. The reparations backlog would continue to rise, and administrative enforcement cases would be processed less expeditiously. The Opinions Section will generally sacrifice quantity rather than quality in its work, because to do otherwise would invite more Court of Appeals litigation and thus would not save staff resources.

Justification of the Request (FY 1987)

Under the requested staffing level of 33, the Legal Counsel would allocate the one additional staff year in FY 1987 primarily to Opinions Section work. This additional staff year would prevent the reparations backlog from increasing beyond its FY 1986 level.

APPENDIX A

AUTOMATED DATA PROCESSING

ESTIMATES OF OBLIGATIONS

AUTOMATED DATA PROCESSING
(Obligations)

	ACTUAL FY 1985	ESTIMATE FY 1986	ESTIMATE FY 1987
1. CAPITAL INVESTMENT ($000)			
A. Purchase of Equipment	192	0	238
B. Purchase of Software & Other Equipment	10	42	12
C. Site or Facility	28	15	20
2. PERSONNEL ($000)			
A. Compensation, Benefits and Travel	888	960	960
B. Work-Years	(27)	(29)	(29)
3. EQUIPMENT, RENTAL, SPACE and OTHER OPERATIONAL COSTS ($000)			
A. Lease of Information Technology Equipment	65	243	354
B. Space	94	124	135
C. Supplies and Other	191	248	332
4. COMMERCIAL SERVICES ($000)			
A. ADPE Time	57	59	73
B. Leased Services	138	119	119
C. Operations and Maintenance	372	279	314
D. Systems Analysis and Programming	340	289	289
E. System Design and Engineering	0	0	0
F. Studies and Other	0	15	60
5. INTERAGENCY SERVICES ($000)			
A. Payments	229	69	91
	$2,604	$2,462	$2,997

ESTIMATE OF FY 1986 ADP OBLIGATIONS

1.	CAPITAL INVESTMENT ($000)		
	A. PURCHASE OF EQUIPMENT		$ 0
	B. PURCHASE OF SOFTWARE		$ 42
	— Computer Performance Measurement Software	($ 35,000)	
	— Information Center Software Packages	($ 7,000)	
	C. SITE OR FACILITY		$ 15
2.	PERSONNEL ($000)		
	A. COMPENSATION, BENEFITS AND TRAVEL		$ 960
	B. WORK - YEARS		
	— Authorized (29)		
	— Estimated Actual (29)		
3.	EQUIPMENT RENTAL, SPACE AND OTHER OPERATIONAL COSTS ($000)		
	A. LEASE OF INFORMATION TECHNOLOGY EQUIPMENT		$ 243
	— AS5000 Replacement CPU (8 months LTOP)	($189,000)	
	— Nixdorf (Chicago)	($ 23,000)	
	— Terminal Controller (Washington)	($ 3,500)	
	— Multiplexors (Chicago and Washington)	($ 21,000)	
	— High Speed Modems (Chicago and Washington)	($ 6,500)	
	B. SPACE		$ 124
	C. SUPPLIES AND OTHER		$ 248
	— Supplies And Other	($ 52,000)	
	— Transportation Of ADP Equipment	($ 1,000)	
	— IBM MVS Operating System	($110,700)	
	— Datacomm DBMS	($ 41,000)	
	— Top Secret Security Package	($ 10,000)	
	— Statistical Analysis System	($ 11,000)	
	— Tape Management System	($ 4,000)	
	— Syncsort	($ 3,000)	
	— FDR, ABR, Compaktor	($ 9,300)	
	— JARS Accounting System	($ 6,000)	

4.	COMMERCIAL SERVICES ($000)		
	A. ADPE TIME		$ 59
	— RCC Market Research	($ 13,000)	
	— LEXIS Legal Research	($ 46,000)	
	B. LEASED SERVICES		$ 119
	— High Speed Communication Lines	($119,000)	
	C. OPERATIONS AND MAINTENANCE		$ 279
	— Data Entry Support Services	($ 50,000)	
	— Computer Output Microfiche Sevices	($ 6,000)	
	— Maintenance AS5000 Processor (6 months)	($ 23,000)	
	— Maintenance Tape Drives and Printer	($ 55,000)	
	— Maintenance Disk Drives	($ 85,000)	
	— Maintenance Front End Processor	($ 6,100)	
	— Maintenance Terminals and Controllers	($ 17,100)	
	— Maintenance Remote Site Printers	($ 15,800)	
	— Maintenance Zilog Multiuser Microcomputer	($ 6,500)	
	— Maintenance Information Center Microcomputers	($ 7,000)	
	— Maintenance Chicago Data Center A/C	($ 5,000)	
	— Maintenance Washington Operations Center A/C	($ 2,500)	
	D. SYSTEMS ANALYSIS AND PROGRAMMING		$ 289
	— Applications Programming Support (per Approved Long Range ADP Plan)	($194,000)	
	— Systems Programming Support	($ 95,000)	
	E. SYSTEM DESIGN AND ENGINEERING		$ 0
	F. STUDIES AND OTHER		$ 15
	— Training (Commercial)	($ 15,000)	
5.	INTERAGENCY SERVICES		
	A. PAYMENTS		$ 69
	— Treasury TP/PIS Payroll System	($ 60,000)	
	— OCLC Library of Congress	($ 6,000)	
	— Training (Interagency)	($ 3,000)	
	TOTAL		$2,462

ESTIMATE OF FY 1987 ADP OBLIGATIONS

1. CAPITAL INVESTMENT ($000)

A. PURCHASE OF EQUIPMENT		$ 238
— Printer For Mainframe Computer	($ 90,000)	
— Microcomputers (10)	($ 63,000)	
— Terminals For Mainframe Computer (20)	($ 30,000)	
— Graphics Terminals (4)	($ 10,000)	
— Low Speed Printers (15)	($ 45,000)	
B. PURCHASE OF SOFTWARE		$ 12
— Information Center Software Packages (12)	($ 12,000)	
C. SITE OR FACILITY		$ 20

2. PERSONNEL ($000)

A. COMPENSATION, BENEFITS AND TRAVEL	$ 960
B. WORK - YEARS	
— Authorized (29)	
— Estimated Actual (29)	

3. EQUIPMENT RENTAL, SPACE AND OTHER OPERATIONAL COSTS ($000)

A. LEASE OF INFORMATION TECHNOLOGY EQUIPMENT		$ 354
— AS5000 Replacement CPU (12 months LTOP)	($300,000)	
— Nixdorf (Chicago)	($ 23,000)	
— Terminal Controller (Washington)	($ 3,500)	
— Multiplexors (Chicago and Washington)	($ 21,000)	
— High Speed Modems (Chicago and Washington)	($ 6,500)	
B. SPACE		$ 135
C. SUPPLIES AND OTHER		$ 332
— Computer Supplies	($ 61,000)	
— Transportation Of ADP Equipment	($ 4,000)	
— IBM MVS Operating System	($110,700)	
— IBM MVS/XA Operating System	($ 72,000)	
— Datacomm DBMS	($ 41,000)	
— Top Secret Security Package	($ 10,000)	
— Statistical Analysis System	($ 11,000)	
— Tape Management System	($ 4,000)	
— FDR, ABR, Compaktor	($ 9,300)	
— JARS Accounting System	($ 6,000)	
— Syncsort	($ 3,000)	

4. COMMERCIAL SERVICES ($000)

A. ADPE TIME

$ 73

-- RCC Market Research ($ 13,000)
-- LEXIS Legal Research ($ 60,000)

B. LEASED SERVICES

$ 119

-- High Speed Communication Lines ($119,000)

C. OPERATIONS AND MAINTENANCE

$ 314

-- Data Entry Support Services ($ 25,000)
-- Computer Output Microfiche Sevices ($ 6,000)
-- Maintenance AS5000 Replacement Processor ($ 45,000)
-- Maintenance Tape Drives and Printer ($ 78,000)
-- Maintenance Disk Drives ($ 93,000)
-- Maintenance Front End Processor ($ 6,100)
-- Maintenance Terminals and Controllers ($ 18,100)
-- Maintenance Remote Site Printers ($ 19,800)
-- Maintenance Zilog Multiuser Microcomputer ($ 6,500)
-- Maintenance Information Center Microcomputers ($ 9,000)
-- Maintenance Chicago Data Center A/C ($ 5,000)
-- Maintenance Washington Operations Center A/C ($ 2,500)

D. SYSTEMS ANALYSIS AND PROGRAMMING

$ 289

-- Applications Programming Support (per Approved Long Range ADP Plan) ($194,000)
-- Systems Programming Support ($ 95,000)

E. SYSTEM DESIGN AND ENGINEERING

$ 0

F. STUDIES AND OTHER

$ 60

-- Physical And Data Security Study ($ 30,000)
-- Training (Commercial) ($ 30,000)

5. INTERAGENCY SERVICES

A. PAYMENTS

$ 91

-- Treasury TP/PIS Payroll System ($ 80,000)
-- OCLC Library of Congress ($ 8,000)
-- Training (Interagency) ($ 3,000)

TOTAL $2,997

APPENDIX B

CPTC PERFORMANCE STATISTICS

PERFORMANCE STATISTICS

ENFORCEMENT

	FY 1985 ACTUAL	FY 1986 ESTIMATE	FY 1987 REQUEST
INVESTIGATIONS			
Pending Beginning of Fiscal Year	126*	139	154
New Investigations Opened	138	135	145
Investigations Closed	125	120	130
Pending End of Fiscal Year	139	154	169
LITIGATION			
Pending Beginning of Fiscal Year	131*	140	145
New Cases Opened	83**	80	85
Cases Completed	77	75	80
Pending End of Fiscal Year	140***	145	150

* The number of investigations and litigation pending at the beginning of FY 1985 was revised following a review of outstanding matters conducted by the Division.

** Does not include five civil contempt motions filed in extant proceedings and one subpoena enforcement action filed as part of an investigation.

*** Includes three cases reopened during FY 1985.

PERFORMANCE STATISTICS

MARKET SURVEILLANCE

	FY 1985 ACTUAL	FY 1986 ESTIMATE	FY 1987 REQUEST
Weekly Surveillance Sheets Prepared	1,902	1,700	1,750
Special Market Surveillance Reports	78	50	55
Reports from Traders and Brokers Processed	572,655	600,000	700,000
Reports Checked for Compliance with Speculative Limits	28,177	32,000	36,000
FCM Audits	129	60	130
Exchange Audits for Speculative Limits	0	2	2
Information Letters Sent	8,145	7,000	6,000
Compliance Letters:			
Reporting Requirements	1,304	1,000	1,200
Speculative Limits	36	35	40
Permanent Records Tables Prepared	11,516	8,200	9,200
Reports Published	1,057	800	1,000

PERFORMANCE STATISTICS

MARKET ANALYSIS

	FY 1985 ACTUAL	FY 1986 ESTIMATE	FY 1987 REQUEST
New Futures Contracts-Completed Reviews	7	21	22
Economic Analysis of Major Rule Changes Completed	62	55	60
New Options Contracts - Completed Reviews	16	9	12
Economic Analysis of Option Rule Changes Completed	9	10	10
Leverage			
Commodity Registration Applications	18	16	0

PERFORMANCE STATISTICS

REGISTRATION

	FY 1985 ACTUAL	FY 1986 ESTIMATE	FY 1987 REQUEST
A. INITIAL AND RENEWAL REGISTRATIONS			
Futures Commission Merchants	25 1/	---	---
Commodity Trading Advisors	404 1/	---	---
Commodity Pool Operators	273 1/	---	---
Leverage Transaction Merchants	1	3	3
TOTAL REGISTRATIONS GRANTED TO FIRMS	703	3	3
Associated Persons of above Firms Temporary Licenses Granted	2,385 1/	300	400
Registration Granted within Six-months of Temporary Licenses or upon Transfer	7,298 1/	300	400
Floor Brokers	6,462	1,500 3/	6,800
B. FITNESS ACTIVITY			
Fitness Checks	4,986	1,800	1,800
Fitness Review	1,353 2/	162	195 4/
Denial or Revocation Actions and Withdrawals of Applications	113	39	55

1/ Until December 3, 1984, when certain processing responsibilities were transferred to NFA.

2/ Includes 900 completed reviews of referrals resulting from fitness checks made by NFA.

3/ Decrease reflects change to two year licensing term.

4/ Increase for FY 1987 due to derogatory information reported on floor broker renewal applications.

PERFORMANCE STATISTICS

FRONT OFFICE AUDIT

	FY 1985 ACTUAL	FY 1986 1/ ESTIMATE	FY 1987 REQUEST
Full Scope and Follow-Up Rule Enforcement Reviews:			
Futures Sales Practices 2/	0	4	4
Options Sales Practices	7	4	6
Audits of LTMs	2	3	3
CPO and CTA Written Requests for Exemption and Interpretation	115	150	150
Telephone Inquiries	2,000	2,000	2,000
Written Inquiries	100	120	120
CPO and CTA Disclosure Documents Reviewed	1,300	500 3/	500
Disclosure Document Deficiency Letters	450	100	100
Enforcement Referrals			
To NFA	15	15	30
To Division of Enforcement	10	15	15
Test Audits of FCMs and IBs	54	50	70 4/

1/ During FY 1986, the staff prepared the report on NFA which was delivered to Congress in January 1986.

2/ Will commence in FY 1986 after NFA's program has been in operation long enough to be evaluated.

3/ In FY 1986, the subprogram will review only a sample of the disclosure documents based on the assumption that NFA will assume responsibility for review of disclosure documents.

4/ Will include branch offices.

PERFORMANCE STATISTICS

FINANCIAL AUDIT AND REVIEW

	FY 1985 ACTUAL	FY 1986 ESTIMATE	FY 1987 REQUEST
DSRO Financial Rule Enforcement Reviews 1/			
Individual:	4	7	7
Horizontal: 2/	1 3/	1	1
Oversight Audits of Futures Commission Merchants	59	40	40
Oversight Audits of Commodity Pool Operators	15	20	20
Audits of Leverage Transaction Merchants	3	3	3
Enforcement Referrals 4/	13	12	12
Financial Statements Reviewed	2,779	3,000	3,000
Noncompliance and Warning Letters Issued	173	175	175

1/ Will include review of clearing organizations as well as field oversight audits of Commission registrants subject to DSRO surveillance.

2/ Horizontal reviews are reviews which examine particular issues on all exchanges.

3/ Includes the Volume Investors special report which covers 13 SROs.

4/ Referrals cannot be accurately estimated since they are generally unplanned and normally result as a by-product of routine oversight audit activities.

PERFORMANCE STATISTICS

PROCEEDINGS

	FY 1985 ACTUAL	FY 1986 ESTIMATE	FY 1987 REQUEST
REPARATIONS CASES			
Complaints Section			
Complaints pending beginning of Fiscal Year	267	196	206
Complaints filed or reinstated	475	500	500
Complaints dismissed	132	130	130
Complaints forwarded for all types of proceedings	414	360	370
Complaints pending end of Fiscal Year	196	206	206
REPARATIONS CASES 1/			
Hearings Section			
Cases pending beginning of Fiscal Year	601	552	492
Cases received for all types of proceedings 2/	499	400	410
Cases dismissed for cause	63	50	40
Cases settled	181	150	120
Cases disposed of by default	63	60	55
Cases disposed of by initial decision	241	200	200
Total dispositions	548	460	415
Cases pending at end of Fiscal Year	552	492	487

1/ The number of dispositions in reparations will decline as the backlog declines and as more emphasis is placed on enforcement actions.

2/ Includes cases remanded or reconsidered.

REPARATIONS INQUIRIES	FY 1985 ACTUAL	FY 1986 ESTIMATE	FY 1987 REQUEST
Telephone Inquiries	6352	7400	7800
Written Inquiries	779	1000	1000
Brochures Sent	1708	1700	1700
ENFORCEMENT CASES			
Hearings Section			
Cases Pending Beginning of Fiscal Year	62	56	56
Cases Received for Adjudication	67	60	70
Cases Settled	35	35	35
Decisions Issued	38	25	30
Total Dispositions	73	60	65
Cases Pending at End of Fiscal Year	56	56	61

PERFORMANCE STATISTICS

LEGAL COUNSEL

	FY 1985 ACTUAL	FY 1986 ESTIMATE	FY 1987 REQUEST
Appellate Litigation			
Reparations	25	25	22
Enforcement Petitions	4	8	10
Enforcement Appeals	13	14	15
Rules/Regulatory Action	3	4	6
Amicus	4	5	7
Other	3	2	3
Total Appellate	52	58	63
District Court Litigation			
Enforcement	17	14	14
Rules/Regulatory Action	7	6	6
Amicus	8	6	4
Private Subpoenas	26	26	26
Bankruptcy	23	25	26
Other	4	3	4
Total District Court	85	80	80
Administrative Litigation			
Personnel/Other	8	8	8
FOIA	36	32	30
Total Administrative	44	40	38
GRAND TOTAL	181	178	181

PERFORMANCE STATISTICS

LEGAL COUNSEL--OPINIONS

	FY 1985 ACTUAL	FY 1986 ESTIMATE	FY 1987 REQUEST
Matters Pending at Beginning of Fiscal Year	151	122	142
Matters Received During Fiscal Year	160	145	140
Matters Completed During Fiscal Year	189	125	140
Matters Pending at End of Fiscal Year	122	142	142

APPENDIX C

STATUS OF FUTURES TRADING — FY 1985

Average Monthend/Open Interest, Estimated Number of Contracts Traded and Number of Contracts Settled by Delivery by Major Groups, All Markets Combined.

Fiscal Year	Total	Grain	Oilseeds/ Products	Livestock/ Products	Foodstuffs	Industrial Materials	Metals	Financial Instruments	Currencies
Average Monthend Open Interest (In contracts)									
1979	1,710,727	247,756	244,532	143,776	74,270	50,578	729,148	186,410	34,257
1980	1,489,380	289,159	249,306	126,881	117,765	61,538	400,483	190,966	52,262
1981	1,739,220	308,041	263,996	108,632	106,658	60,978	427,104	408,813	55,028
1982	1,434,613	229,659	186,906	127,410	98,669	65,669	293,645	359,038	73,550
1983	1,603,818	264,859	215,929	119,160	128,073	89,366	335,174	332,588	118,669
1984	1,779,206	291,083	223,056	104,286	144,517	103,111	360,888	371,330	180,935
1985	1,758,371	212,157	173,058	100,667	141,328	116,224	350,531	523,301	141,105
Number of Contracts Traded									
1979	74,309,239	13,023,423	16,569,675	11,529,178	2,359,884	2,374,090	21,878,549	4,570,694	2,003,746
1980	82,691,169	18,287,003	15,691,770	11,807,659	5,314,210	3,559,799	14,099,125	10,212,968	3,718,635
1981	101,124,296	19,807,558	20,314,830	9,803,734	4,548,843	3,290,318	17,869,752	20,091,322	5,397,939
1982	107,644,019	14,884,631	15,763,008	10,967,892	3,580,270	3,605,325	19,307,005	31,251,497	8,284,391
1983	136,077,049	17,793,846	19,823,188	11,062,975	4,838,026	4,689,758	26,316,268	40,154,894	11,398,094
1984	148,822,234	15,889,408	23,488,506	8,429,245	4,690,165	6,214,199	22,446,535	51,003,284	16,660,892
1985	152,589,653	10,726,379	14,883,445	7,925,991	4,464,560	7,701,343	18,383,469	72,127,016	16,377,450
Number of Contracts Settled by Delivery									
1979	410,606	65,093	93,217	14,171	25,194	5,588	179,132	21,350	6,861
1980	598,896	65,998	170,748	15,088	29,798	7,189	254,679	32,854	22,544
1981	757,089	85,573	239,738	14,513	25,117	19,345	275,606	47,728	49,471
1982	669,483	118,272	173,357	7,583	20,223	32,649	218,500	50,082	47,817
1983	806,308	73,394	188,454	8,740	19,843	28,091	305,655	116,066	66,065
1984	1,208,102	109,644	438,441	10,265	18,701	42,594	284,614	161,284	142,559
1985	1,170,428	133,794	192,502	15,068	25,695	58,844	242,871	341,328	160,326

Contract Market Review Estimated Average Open Interest, 12-Month Volume of Trading and Deliveries by Commodity for the Fiscal Years Ending September 30, 1984 and September 30, 1985.

Exchange/Commodity	Contract	Monthend Open Interest (Contracts)		Volume of Trading (Contracts)		Total Contracts Settled by Delivery (Contracts)	
		1983–84	1984–85	1983–84	1984–85	1983–84	1984–85
Chicago Board of Trade (CBT)							
Wheat	5,000 Bu.	52,771	38,881	3,191,284	2,176,635	40,480	34,600
Corn	5,000 Bu.	182,117	123,114	10,206,725	6,503,220	28,720	68,135
Oats	5,000 Bu.	4,819	3,524	180,315	95,672	8,910	3,300
Soybeans	5,000 Bu.	91,223	66,721	13,542,101	7,215,779	342,970	64,415
Oil, Soybean	60,000 Lbs.	59,172	49,097	4,282,439	3,595,503	40,000	3,282
T-Bonds	$100,000	181,154	218,849	27,097,207	36,697,688	63,256	55,226
Meal, Soybean	100 Tons	58,103	45,154	4,107,051	3,265,961	50,507	122,826
T-Notes, 6.5–10 Year	$100,000	24,975	46,722	1,394,012	2,501,942	11,450	23,831
GNMA (Mortgages)	$100,000	31,902	5,638	1,128,441	136,472	14,907	3,879
GNMA II (Mortgages)	$100,000	1,981	99	37,466	149	1,339	15
Silver, 1000 Oz.	1,000 Oz.	36,505	25,699	2,054,867	1,188,805	31,574	28,127
Gold (1 Kilogram)	Kilo	2,652	2,361	324,891	210,704	2,559	5,457
Stock Index, Amex MM[1]	$100 x Index	6,293	10,992	663,112	2,799,835	0	73,222
Stock Index, Amex MMM[1,2]	$250 x Index	—	1,753	—	132,519	—	2,157
Bonds, Muni[3]	$100 x 88 Muni Bond Index	—	3,679	—	175,462	—	0
Silver, 5000 Oz.	5,000 Oz.	0	0	9	0	0	0
Gasoline, Unleaded	42,000 Gals.	0	0	5	0	0	0
Oil, Crude	42,000 Gals.	195	0	6,346	0	156	0
Oil, Heating	42,000 Gals.	2	0	8	0	0	0
Plywood	76,032 sq. ft.	363	0	9,536	0	615	0
Total CBT		734,227	642,283	68,225,815	66,696,346	637,443	488,472

See footnotes at end of table.

Contract Market Review/Estimated Average Open Interest, 12-Month Volume of Trading and Deliveries by Commodity for the Fiscal Years Ending September 30, 1984 and September 30, 1985.

Exchange/Commodity	Contract	Monthend Open Interest (Contracts)		Volume of Trading (Contracts)		Total Contracts Settled by Delivery (Contracts)	
		1983–84	1984–85	1983–84	1984–85	1983–84	1984–85
Mid America Commodity Exchange (MCE)							
Wheat	1,000 Bu.	10,935	9,149	376,677	378,285	1,525	945
Corn	1,000 Bu.	14,219	11,375	643,120	479,380	269	217
Oats	1,000 Bu.	177	66	8,749	1,974	135	25
Soybeans	1,000 Bu.	14,555	11,401	6,556,915	796,981	4,964	1,853
T-Bonds	$50,000	1,098	1,302	231,307	311,622	118	1
Meal, Soybean[4]		—	685	—	9,221	—	126
T-Bills, US 90 Days[1]	$500,000	331	346	30,925	36,348	5	8
Hogs, Live	15,000 Lbs.	2,343	2,408	108,253	85,384	118	357
Cattle, Live	20,000 Lbs.	973	685	82,768	65,026	53	95
Platinum	25 Tr. Oz.	15	25	87	1,056	0	4
Silver 1-Bar	1,000 Oz.	928	326	28,415	6,936	1,449	763
Silver, NY Delivery	1,000 Oz.	349	1,303	15,479	53,392	153	248
Copper[5]	12,500 Lbs.	—	78	—	4,036	—	34
Gold New	33.2 Oz.	1,348	83	72,743	1,354	1,277	112
Gold, NY Delivery	33.2 Oz.	780	738	10,516	35,758	88	215
Dollars, Canadian	50,000	35	48	2,545	3,692	0	2
Franc, Swiss	62,500	595	629	93,241	112,529	6	8
Mark, Deutsche	62,500	390	727	52,199	91,353	6	16
Pound Sterling	12,500	108	289	6,631	20,188	6	2
Yen, Japanese	6,250,000	463	326	39,409	30,124	0	2
Sugar, Refined	40,000 Lbs.	19	0	60	0	58	0
Total MCE		49,661	41,989	3,360,039	2,524,619	10,230	5,033

Contract Market Review/Estimated Average Open Interest, 12-Month Volume of Trading and Deliveries by Commodity for the Fiscal Years Ending September 30, 1984 and September 30, 1985.

Exchange/Commodity	Contract	Monthend Open Interest (Contracts)		Volume of Trading (Contracts)		Total Contracts Settled by Delivery (Contracts)	
		1983–84	1984–85	1983–84	1984–85	1983–84	1984–85
Kansas City Board of Trade (KCBT)							
Wheat	5,000 Bu.	19,648	20,307	939,024	776,900	18,085	13,270
Stock Index, VLA[1]	$500 x Index	3,854	7,111	866,602	1,060,289	3,293	4,430
Stock Index, MVL[1]	$100 x Index	692	284	32,256	21,766	1,346[1]	484
TOTAL KCBT		24,194	27,702	1,837,882	1,858,955	22,724	18,184
Minneapolis Grain Exchange (MGE)							
Wheat	5,000 Bu.	5,866	5,461	336,579	309,858	10,997	11,611
Wheat, White	5,000 Bu.	261	266	767	4,379	0	1,630
TOTAL MGE		6,127	5,727	337,346	314,237	10,997	13,241
Chicago Rice & Cotton Exchange (CRCE)							
Cotton, Short Staple	100 Bales	—	47	—	1,706	—	0
Rice, Rough	200,000 Lbs.	270	14	6,168	76	523	61
Total CRCE		270	61	6,168	1,782	523	61
Philadelphia Board of Trade (PBOT)							
Stock Index, XOC[10]	$500 x Index	—	124	—	89	—	0
Total PBOT		—	124	—	89	—	0

Contract Market Review/Estimated Average Open Interest, 12-Month Volume of Trading and Deliveries by Commodity for the Fiscal Years Ending September 30, 1984 and September 30, 1985.

	Contract	Monthend Open Interest (Contracts)		Volume of Trading (Contracts)		Total Contracts Settled by Delivery (Contracts)	
		1983–84	1984–85	1983–84	1984–85	1983–84	1984–85
Chicago Mercantile Exchange (CME) and International Monetary Market (IMM)							
T-Bills, US 90 Days	$1,000,000	47,791	40,573	3,463,535	2,657,319	6,179	5,800
Hogs, Live	30,000 Lbs.	30,326	23,604	2,272,732	1,736,426	438	821
Pork Bellies	38,000 Lbs.	15,965	11,246	2,005,455	1,573,661	4,793	4,187
Cattle, Live New	40,000 Lbs.	47,580	54,195	3,614,281	4,053,402	2,658	7,586
Lumber	130,000 Bd. Ft.	7,883	9,025	742,540	662,753	332	368
Cattle, Feeder	42,000 Lbs.	7,099	8,529	345,756	412,092	2,205	2,022
Gold	100 Tr. Oz.	959	51	112,316	209	2,129	37
Dollars, Canadian	100,000	7,020	9,410	328,320	432,472	6,476	10,470
Franc, French	250,000	897	856	8,902	10,834	6,556	2,921
Franc, Swiss	125,000	23,315	26,822	4,137,155	4,551,347	15,598	28,522
Mark, Deutsche	125,000	30,553	47,510	4,708,781	6,530,280	27,267	52,415
Peso, Mexican	1,000,000	1,938	1,481	18,478	13,551	3,914	1,265
Pound Sterling	25,000 Pounds	18,536	30,424	1,380,950	2,616,483	25,069	42,206
Yen, Japanese	12,500,000	28,282	22,583	2,819,494	1,964,597	25,216	22,497
CD's 90-Day	$1,000,000	27,794	8,753	1,115,728	145,432	1,341	164
Eurodollars (3-Mo)	$1,000,000	68,802	110,005	3,064,787	8,211,904	37,445	69,355[1]
Stock Index, S&P 500	$500 x Index	31,381	57,049	11,059,199	14,323,014	43,090[1]	87,977[1]
Stock Index, S&P 100	$100 x Index	2,776	75	365,661	5,649	10,433[1]	338
Gasoline, Leaded Reg.	42,000 Gal.	228	0	4,045	0	377	0
Fuel Oil, No. 2	42,000 Gal.	164	0	4,601	0	130	0
Total CME/IMM		399,289	462,191	41,572,716	49,901,425	216,636	338,951

Contract Market Review/Estimated Average Open Interest, 12-Month Volume of Trading and Deliveries by Commodity for the Fiscal Years Ending September 30, 1984 and September 30, 1985.

		Monthend Open Interest (Contracts)		Volume of Trading (Contracts)		Total Contracts Settled by Delivery (Contracts)	
New York Mercantile Exchange (NYME)							
Oil, Heating No. 2	42,000 Gal.	24,559	22,033	2,027,968	2,126,852	12,680	13,210
Potatoes, Maine C/S[1]	50,000 Lbs.	1,496	1,507	27,333	20,849	353[1]	1,549
Oil, Crude (Sweet)	1,000 Brl.	26,170	51,410	1,415,616	3,525,992	11,768	26,865
Palladium	100 Tr. Oz.	7,247	6,849	194,988	133,790	1,525	2,371
Platinum	50 Tr. Oz.	14,754	13,680	632,795	590,846	11,525	7,348
Gasoline, Leaded	42,000 Gal.	14,955	11,029	711,449	588,851	12,318	11,931
Gasoline, Unleaded[6]	42,000 Gal.	—	3,705	—	103,375	—	3,320
Potatoes, Rd. White	50,000 Lbs.	0	0	589	0	5	0
Total NYME		89,181	110,213	5,010,738	7,090,555	50,174	66,594
New York Cotton Exchange and Associates (NYCE)							
Cotton No. 2	50,000 Lbs.	27,498	18,414	1,268,292	676,341	2,736	1,946
Orange Juice	15,000 Lbs.	9,858	6,662	296,396	161,895	3,803	3,353
Propane Gas	42,000 Gal.	1,093	561	23,793	15,473	1,482	1,204
Total NYCE		38,449	25,637	1,588,481	853,709	8,021	6,503
Coffee, Sugar and Cocoa Exchange (CSCE)							
Cocoa	10 metric tons	25,895	22,355	1,216,578	828,811	4,302	8,863
Sugar No. 11	112,000 Lbs.	85,253	86,277	2,343,317	2,835,647	3,767	3,468
Sugar No. 12	112,000 Lbs.	12,019	10,390	99,587	95,261	4,833	3,793
Sugar No. 14[7]	112,000 Lbs.	—	2,368	—	5,661	—	0
Coffee C	37,500 Lbs.	9,977	11,769	506,305	516,436	1,580	4,669
Index, CPI-W[8,1]	$100 x Index	—	87	—	1,220	—	5
Total CSCE		133,144	133,246	4,365,787	4,283,036	14,482	20,798

TUESDAY, MARCH 18, 1986.

ECONOMIC RESEARCH SERVICE

WITNESSES

ROBERT L. THOMPSON, ASSISTANT SECRETARY FOR ECONOMICS
JOHN E. LEE, JR., ADMINISTRATOR, ECONOMIC RESEARCH SERVICE
STEPHEN B. DEWHURST, BUDGET OFFICER, DEPARTMENT OF AGRICULTURE

OPENING STATEMENT

Mr. AKAKA. We appreciate your presence here, Mr. Thompson, Dr. Lee, and Mr. Dewhurst, and we would like to hear from you about the Economic Research Service. I would like to say that we will include your testimony into the record, and you may proceed any way you want to.

Mr. THOMPSON. Thank you, Mr. Chairman.

It is a pleasure for all of us to be here, and I'll just turn immediately to John Lee, who is the Administrator of the Economic Research Service for his presentation, and then we will go sequentially through the other agencies.

Mr. AKAKA. Thank you very much. Mr. Lee.

Dr. LEE. Thank you, Mr. Akaka and members of the committee. I, again, appreciate this opportunity to come talk about the Economic Research Service and our budget request for 1987.

It seems, Mr. Chairman and Mr. Myers, that every time we're here we are talking about some stress or some adjustment that agriculture is going through. We geared up for World War I and spent the '20s and the '30s gearing down, making big adjustments, and then geared up again for World War II. We then had a postwar adjustment to go through. We spent the '50s and the '60s going through a major technological revolution in agriculture that restructured it from what it had been to a scientific, modern, capital-intensive industry with two or three million farms instead of six million farms. Then we hit the export boom period of the 1970s, and we had takeoffs in land prices, takeoffs in exports, a lot of expectations about what the long term would mean. In the meantime, a number of problems were developing that were later to crop up. Things weren't as great as we now look back and remember them being, because at that time, we had tractorcades on the mall and the AAM was being formed in response to concerns about what was happening in the farm sector.

Other groups were expressing their concerns, and now we find ourselves in the 1980s where we again are going through a major readjustment to what may be a more realistic set of long-term expectations.

Around these ups and downs in agriculture, these adjustments have evolved a complex set of programs, partly in response to those adjustment problems. The mission of the Economic Research Service has been and is to provide an information base to try to help the Legislative and the Executive Branches develop policies to help agriculture find, if you will, its rightful place in the world market, to try to provide information to policy-makers to design appropriate policies that complement the market opportunities that we actually have, not confound those market opportunities, to help develop effective programs that would meet those policy goals, and also to try to help those people who are actually doing the adjusting out there, the farmers, the people on the input supply side, the people on the processing and marketing side, to try to help those people make the actual adjustments they have to go through.

Now to provide this information, we do research on domestic commercial agriculture. We're looking at what's happening in the commodity sectors, providing an information base on supply, demand, and price on commodities, and that information base is essentially the information base that drives the industry both here and abroad.

We also look at marketing problems, input supply problems, all those things in the domestic sector.

We have a program of research on international trade and international agriculture. Examples there include things like a study to look at our competitive position in the world market, a new study that we are launching now. What is our long-term competitive position in the world market for various commodities, and particularly what can we do to enhance that competitive position in the world market?

We are looking at developing information that will be useful to the United States as it enters into the multilateral trade negotiations process to try to strengthen both our bargaining position and to have a better understanding of what would be a more effective strategy there.

Also, we are looking at trade liberalization activities, both in terms of learning more about how policies of other countries, as well as the United States, affect our competitive position, distort the competitive position, and what we can do to realize the benefits of some liberalization and reducing of those distortions.

We do research in natural resources and input markets. For example, looking at whether or not the programs that are set up to protect our resource base are cost-effective and whether we could use the funds in a more cost-effective way. How do we develop effective programs that deal with problems of water quality, with problems of major inputs such as pesticides and fertilizers, and how do we have a balanced approach between the needs of the farmer and the needs of others who are concerned with environmental problems, for example.

We also do research on rural areas, including agriculture in the rural areas, and how the agricultural industries link to the well-being of that larger population out there in those rural areas—the small towns, rural communities, who are feeling both the impacts of progress when there's progress and of hard times when there are hard times.

We deliver the results of this research through publishing literally hundreds of reports. We do hundreds of staff analyses for the Legislative and Executive Branches, and we respond to literally thousands of public inquiries and requests.

However, ERS is primarily a silent partner in this information process. When that farmer out there reads his farm magazine or looks at the newspaper and reads the commodity page to find out what the prospects are and what the experts are saying, most frequently that information base comes from ERS, although our name won't be associated with it.

When the private consultant is advising clients, most frequently he is operating off of a base that ultimately came out of statistics from SRS and analyses from ERS, but our name won't be associated with it.

When private forecasters publish their forecasts and they're quoted, the information base that they start from as a point of departure comes out of the economic agencies in the Department of Agriculture; Statistics and Economics.

Also, when the members of the Congress ask such groups as the Congressional Research Service, the OTA, the GAO to do studies related to agriculture, it is frequently the case that they draw heavily on the product of the Economic Research Service.

So we are not often seen, but we are there behind the scenes. We seek and we get a lot of good feedback. We want to know whether the ultimate customers, both in the countryside and in the Congress and in the Administration, are getting the product they need to make good policy decisions or to make good market decisions.

We try to be responsive, because we want to be deserving of the support that this committee has provided. On April 3, 1961, the Statistical Reporting Service and the Economic Research Service were established. So the week after next, we will celebrate a silver anniversary. We celebrate that anniversary in very tough times. We want to make sure that we are using every dollar of what you appropriate, whatever level you choose to appropriate, so that both the taxpayers out there and those of you who are familiar with our programs will feel that we deserve a start on our second 25 years.

We are committed in the Economic Research Service, I and the management team that is backing me up, back here in the seats behind me, to making effective use of every dollar that you appropriate to provide good, solid, objective, honest, and useful economic information.

We greatly appreciate this chance to be here and look forward to trying to respond to your questions, Mr. Chairman.

Mr. AKAKA. Thank you very much, Administrator Lee.

[CLERK'S NOTE.—The full text of Mr. Lee's prepared statement appears on pages 211 through 226. The explanatory notes appear on pages 227 through 252.]

Mr. AKAKA. I was interested in reading the comments in your written testimony about the importance of ERS. It seems as though, as you point out, there is a lot of confusion in the farming community in our country. Unless an agency like ERS sorts things out, then nobody is going to do it. I think that was the sense of your text.

Dr. LEE. Yes, sir.

LOW INTEREST RATES

Mr. AKAKA. Right now we are benefitting from the low interest rates, also the decline in the value of the dollar, also the decline in the price of oil, and we know that this affects the economy of our country, particularly for farmers.

How have these factors affected our farmers?

Dr. LEE. These things all offer prospects of an improved situation in the farm sector. Now these things take a while to work their way through the system. The benefits of lower petroleum prices will help us both in terms of lower costs here, but also in the international market where it will reduce the foreign exchange problems that all importing countries have, and hopefully will free up more money that they can use for trade, including purchase of our agricultural products.

On the interest rate side, that's a very, very critical factor for the farm sector, not only on the domestic cost side, where it is the single most important cost—it's the largest cash cost that farmers pay. Over 20 percent of their total cash costs now are interest. So for every percent that we can get the average interest rate down on that farm debt, we will save a substantial amount of cost to the farm sector.

Now those interest rates are working their way through the farm lending system rather slowly, because there's a lot of debt out there that's still at the old high interest rates, and it takes a while to roll that over. Agencies like the Farm Credit System and others have, in addition to what the current costs of money are, to deal with their cost of doing business and the risks and the losses in their portfolio. So these things are working their way to farmers rather slowly. However, they are working their way out, and farmers are beginning, in some cases, to refinance their high-cost debt at lower rates and, in other cases, to find better bargains in credit this year than in the past. So that will benefit them.

The big impact will be on the demand side internationally. As interest rates come down, we should see some improvement in the value of the dollar, and that will lead ultimately to some improvement in exports. Now our analysis suggests that it takes a while to work through the system, anywhere from a year to eighteen months to see significant results of the improved value of the dollar, for example.

I should add that while the overall value of the dollar—that is, against a total trade-weighted dollar—has declined against other currencies, when we look at the customers who buy our foreign products—wheat, for example, and others—and look at how their currencies have appreciated or depreciated against the dollar, we have not yet gotten this great improvement, this decline in the value of the dollar. It varies by commodity.

Moreover, when we look at how our currency has depreciated a bit and compare it with our competitors', such as Australia, Canada, and other exporters, they, too, have had depreciating currencies—well, we haven't really made much progress in terms of improving our competitive position. We think that's coming, but we

haven't seen yet the improvement in the exchange rate from the agricultural commodity perspective that we've seen in the overall basket of currency.

LOW INTEREST RATES AFFECT FARMERS

Mr. AKAKA. My interest in this is that there is benefit associated with these factors, and my interest would be, how long will it be before farmers can expect to feel the full impact of these benefits?

Dr. LEE. How long would the lag effect be?

Mr. AKAKA. I think you said eighteen months.

Dr. LEE. We certainly would not expect there to be a major visible impact of these events this year, but certainly by next year, if these trends continue, if interest rates continue to be lower than they were and if they come down more, and if the value of the dollar does decline against agricultural commodities and oil prices come on down or stay low, there will definitely be some impact. It's hard to quantify just how much and how fast, because it's going to depend on our relationship with individual countries quite a bit.

PESTICIDE STUDY

Mr. AKAKA. Yes. On your page 15, you mention pesticides.

Dr. LEE. Yes.

Mr. AKAKA. And the higher cost of pest control alternatives and indicate that there is a study of the economic effects of removing pesticides that are environmentally harmful from the market.

What were the results of this study?

Dr. LEE. Generally, Mr. Chairman, the study shows that, as one might expect, that if you were to take away from agriculture a whole category of pesticides, there would be a major impact, because the farmers would not have substitutes in the short run that they could use.

If you take away individual pesticides, not one by one, but just take away one where farmers are allowed substitutes, there are some minor impacts, but they can usually survive or deal with those impacts.

So it becomes a matter of whether individual pesticides one by one get banned and new ones get developed, or whether there is an attempt to remove whole categories of pesticides, which would have a very disastrous short-term effect, at least, on the farm sector.

In the longer term we would hope that developments involving technology would reduce the dependence on pesticides.

We can, if you wish, provide more information for the record on the results of that study.

Mr. AKAKA. Yes, I'd like that.

[CLERK'S NOTE.—The report appears on pages 253 through 278.]

Mr. AKAKA. I'm going to ask this question later as to how do you see the transition of American agriculture for the future, and as we consider our appropriations bills, this certainly will be foremost in our minds as to what is the future of all of these transitions that we expect. But I'll ask that a little later.

May I call on Gentlewoman Smith?

Mrs. SMITH. Thank you very much, Mr. Chairman.

And I welcome Mr. Thompson, Mr. Lee, Mr. Dewhurst and all of you.

I was much interested in your thoughtful comments about what the reduction in oil prices, interest and the hope for increase in exports would do. Let me point out that out in Nebraska, the second most agricultural Congressional district in the nation, Mr. Chairman, last year diesel fuel—which is very important to us—was a little over a dollar. Now it is a little less than 50 cents.

Well, energy costs in a country where we must pump irrigate is 15 to 20 percent of our costs. So this is already very significant.

But also, in our area, 53 percent of our borrowing is from the Federal Land Bank and they are still charging 13 percent. They say they are lowering, I believe, to 12.5 percent this month. But this is still not competitive.

And you know, I like to read in the paper about how the prime rate is down to 9 percent, but we also cannot take advantage of it. Our interest rates have not, so far, come down.

The Farm Credit System is going to be appearing before us next week and was organized to help farmers. It is not doing this at the present time. And, of course, I agree that we cannot expect the benefit from the exports to come to us immediately.

Let me ask you this. What is ERS doing to make sure that the financial information regarding our hard-pressed farmers and ranchers in the Midwest is current and accurate? You know, you hear different kinds of estimates and you wonder just what is the truth.

Dr. LEE. Yes, there has been considerable confusion, and we—for that reason last year initiated a major national survey called the Farm Costs and Returns Survey. However, basically, it was a major economic finance survey. It went out to over 20,000 farms and it was nation-wide in its coverage.

From that survey, results were available in the last spring, early summer. From that survey, we were able to estimate some proxies, if you will, because the only way you can tell if an individual farmer is in serious financial trouble is to look at his or her individual records, and that is virtually impossible.

However, we developed some proxy measures that certainly turned out to be good indicators, or have been good indicators of farmers that are likely to be in trouble.

These basically relate to their debt situation and to their cash flow situation. When you combine those two measures and look at the farmers that have not only a heavy debt load but have cash flow problems, we begin to put a fence around a set of farmers that has serious problems.

That survey produced a tremendous wealth of information which we have been analyzing and with which, starting last summer, we started producing publications which were widely circulated and from which there were a large number of news stories and other things, to get information out.

We have been drawing heavily on that survey until this year. We have been working on improving that survey. The Statistical Re-

porting Service is now in the field, in February and March, collecting information. Again, a large national survey. We put all the resources we could get into this, to make it the best possible and the largest possible survey, so that we will soon have data coming in at the state level, being put together, and then sent in so that we can aggregate it.

About late May or early June, we will have a new set of data on the conditions in the farm sector that will be up to date, up to—let us say this winter, the winter we are now ending, so that we would have a better fix on conditions.

We do not have any preliminary assessment yet from those data. There are some individual states that are conducting surveys that are trying, now, to do a better job of coordinating one state to the next, and they have been sharing their results with us.

So we have a very good data base. We are working hard to get information from that data base published and out. We also invite other researchers to work with us in the use of that data base. There have been researchers from other places making use of it.

We do have to be careful because when farmers give us that information, they ask and they expect that we will treat it with confidence. So we cannot share the microdata. That is, we cannot provide data from the individual farm that others can use.

However, people can come sit down with us and ask us to make tabulations for them, for their research, at the University of Nebraska, Iowa, or any other place, and we will supply that information for them and assist them in that analysis.

ERS INPUT INTO CURRENT FARM PROGRAMS

Mrs. SMITH. Well, I can see you are doing a very thorough and careful job on this. You pointed out, in your testimony, that farms are changing in structure, in size, in technology, in number, and so on.

Does ERS get to have any input into current farm programs, to allow them to address these changes more satisfactorily?

Dr. LEE. We certainly do. We get very much involved at the request of the Department and others, in analyzing not only proposed options but in providing information that people can use to determine possible workable options whether they be commodity programs or conservation programs or credit programs.

We would like to feel that we provided useful information to the Farm Bill formulation process this past year.

Mrs. SMITH. Just one more quick question, because I see we have a vote on the floor. Has the ERS conducted any research on the effects that grain quality has on our export market?

Dr. LEE. Yes, we have. We have assisted the Federal Grain Inspection Service do some analysis, on the grain quality problem. There have been a couple of studies done with them, and I would be happy to supply that information for the record.

Mrs. SMITH. Thank you very much.

[CLERK'S NOTE.—The report appears on pages 279 through 321.]

Mr. Chairman, I would just like to conclude by pointing out a statement from Mr. Lee's testimony because I think it ought to be underlined in the record.

Contract Market Review/Estimated Average Open Interest, 12-Month Volume of Trading and Deliveries by Commodity for the Fiscal Years Ending September 30, 1984 and September 30, 1985.

Contract		Monthend Open Interest (Contracts)[1]		Volume of Trading (Contracts)		Total Contracts Settled by Delivery (Contracts)	
		1983–84	1984–85	1983–84	1984–85	1983–84	1984–85
Commodity Exchange Inc. (CMX)							
Silver	5,000 Tr. Oz.	62,527	75,157	7,075,393	5,170,308	69,467	75,079
Copper	25,000 Lbs.	96,129	83,384	2,550,304	2,522,250	59,486	31,748
Gold	100 Tr. Oz.	133,860	137,834	9,308,654	8,374,171	98,694	87,758
Aluminum	40,000 lbs.	2,838	2,963	65,078	89,874	4,688	3,570
Total CMX		295,354	299,338	18,999,429	16,156,603	232,335	198,155
New York Futures Exchange (NYFE)							
Stock Index, NYSE CM[1]	$500 x Index	9,310	9,860	3,517,833	2,908,297	4,537[1]	14,436
Total NYFE		9,310	9,860	3,517,833	2,908,297	4,537	14,436
Total All Contracts		1,779,206	1,758,371	148,822,234	152,589,653	1,208,102	1,170,428

[1] Cash Settlement
[2] Trading began August 8, 1985
[3] Trading began June 16, 1985
[4] Trading began April 22, 1985
[5] Trading began November 2, 1984
[6] Trading began December 3, 1984
[7] Trading began July 8, 1985
[8] Trading began June 21, 1985
[9] Trading began January 29, 1985
[10] Trading began September 18, 1985

Options—Average Monthend Open Interest and 12-Month Volume of Trading for Fiscal Years Ending September 30, 1984 and September 30, 1985.

Exchange/Commodity	Contract	Monthend Open Interest (Contracts)						Volume of Trading (Contracts)					
		1983–1984			1984–1985			1983–1984			1984–1985		
		Calls	Puts	Total	Calls	Puts	Total	Calls	Puts	Total	Calls	Puts	Total
Chicago Board of Trade													
U.S. Treasury Bonds	$100,000	109,345	53,022	162,367	145,127	129,298	274,425	—	—	5,441,505	—	—	9,844,236
U.S. Treasury Notes[1]	$100,000	—	—	—	3,926	3,475	7,401	—	—	—	—	—	79,500
Soybeans[2]	5,000 Bu.	—	—	—	269,150	90,698	359,848	—	—	—	—	—	667,873
Corn[3]	5,000 Bu.	—	—	—	139,225	81,943	221,168	—	—	—	—	—	234,367
Silver[4]	1,000 oz.	—	—	—	819	228	1,047	—	—	—	—	—	8,204
Coffee, Sugar and Cocoa Exchange													
Sugar #11	112,000 lbs.	2,667	220	2,887	7,073	633	7,730	7,915	1,242	9,157	58,627	7,650	66,277
Commodity Exchange, Inc.													
Gold	100 tr. oz.	35,098	23,383	58,481	46,370	33,409	79,979	649,735	540,843	1,190,598	843,710	687,884	1,531,594
Silver[5]	5000 tr. oz.	—	—	—	10,491	12,352	28,843	—	—	—	296,364	204,957	501,323
Chicago Mercantile Exchange													
S&P 500 Stock Index	$500 x Index	11,405	11,983	23,388	18,575	17,266	35,841	—	—	568,571	—	—	989,464
Deutsche Mark	125,000	30,414	8,269	38,683	37,316	21,988	59,304	—	—	486,082	—	—	1,462,398
Live Hogs[6]	30,000 lbs.	—	—	—	3,096	1,332	4,428	—	—	—	—	—	40,556
Live Cattle[7]	40,000 lbs.	—	—	—	6,807	4,010	10,817	—	—	—	—	—	208,327
Eurodollar[8]	$1,000,000	—	—	—	12,814	18,953	31,767	—	—	—	—	—	466,477
British Pound[9]	25,000	—	—	—	9,786	9,684	19,470	—	—	—	—	—	245,360
Swiss Franc[9]	125,000	—	—	—	8,705	6,882	15,587	—	—	—	—	—	236,197
New York Futures Exchange													
NYSE Composite Stock Index	$500 x Index	4,770	2,589	7,359	4,787	3,019	7,806	—	—	237,575	132,734	59,767	192,501
Kansas City Board of Trade													
Wheat[2]	5,000 bu.	—	—	—	1,036	629	1,635	—	—	—	—	—	12,182
Minneapolis Grain Exchange													
Spring Wheat[2]	5,000 bu.	—	—	—	393	90	483	—	—	—	—	—	4,336
MidAmerica Commodity Exchange													
Gold	33.2 oz.	17	2	19	123	9	132	—	—	38	—	—	913
Wheat[2]	1,000 bu.	—	—	—	543	173	718	—	—	—	—	—	5,968
Soybeans[10]	1,000 bu.	—	—	—	7,163	946	8,109	—	—	—	—	—	5,360
New York Cotton Exchange													
Cotton[7]	50,000 lbs.	—	—	—	3,300	1,277	3,577	—	—	—	18,000	7,346	25,346

Options—Average Monthend Open Interest and 12-Month Volume of Trading for Fiscal Years Ending September 30, 1984 and September 30, 1985.

Exchange/Commodity	Contract	Monthend Open Interest (Contracts)						Volume of Trading (Contracts)					
		1983–1984			1984–1985			1983–1984			1984–1985		
		Calls	Puts	Total	Calls	Puts	Total	Calls	Puts	Total	Calls	Puts	Total
AMEX Commodity Corporation													
Gold[11]	100 tr. oz.	—	—	—	2,579	3,281	5,860	—	—	—	14,721	17,760	32,481
Philadelphia Board of Trade													
Eurodollars[12]	$1,000,000	—	—	—	8	20	28	—	—	—	61	120	181
Total Options		183,716	99,468	283,184	744,408	441,617	1,186,025	N/A	N/A	7,953,528	N/A	N/A	16,866,923
Grand Total—Futures and Options				2,062,390			2,944,396			156,775,762			169,456,576

[1] Trading began May 1, 1985
[2] Trading began October 31, 1984
[3] Trading began February 27, 1985
[4] Trading began March 29, 1985
[5] Trading began October 4, 1984
[6] Trading began February 1, 1985
[7] Trading began October 30, 1984
[8] Trading began March 20, 1985
[9] Trading began February 25, 1985
[10] Trading began February 8, 1985
[11] Trading began April 26, 1985
[12] Trading began May 10, 1985

It says "Each dollar earned from agricultural exports, stimulates another $1.37 in output in the United States economy. Approximately 80 percent of that additional economic activity accrues to the non-farm sector. Over a million jobs are related to the United States agricultural exports."

Mr. AKAKA. Thank you very much.

Mr. Watkins.

BREAK EVEN PRICE

Mr. WATKINS. Just a couple of quick questions.

What, in general, is the break even price you are showing for most farmers?

Dr. LEE. Which crop, Mr. Watkins?

Mr. WATKINS. Wheat and corn.

Dr. LEE. I am sorry. I cannot recall the exact numbers and they do change from year to year, but I do have that information and will supply it for the record, Mr. Watkins.

We do have that information. We do not report it as a break even price. What we show are the averages by region, so it will not be for an individual farmer, but an average by region of his out-of-pocket costs that he has to cover to operate. Then we show what some of the other, indirect costs are, and what is left over.

CASH FLOW FOR FARMERS

Mr. WATKINS. Have you run any data on what percent of the farmers will at least cash flow at more competitive prices?

Dr. LEE. Well, one has to make some assumptions about what those more competitive prices are. We—this year, in our Farm Costs and Returns Survey—are collecting data that will allow us to estimate a distribution of costs, so that not only will we know of costs per region, but we will know how many farmers can produce corn or wheat at various prices and make a profit.

Mr. WATKINS. Maybe you can answer those questions for the record. I do not want a long, drawn out answer. I just want to get to the meat of the data.

I would like to ask you to get that answer to us.

[The information follows:]

Lower loan rates (e.g., $1.92 for the 1986 corn crop) are expected to result in a temporary, initial drop in prices of program commodities. This would adversely affect farmers' cash flow position if they do not sign up for the programs. For farmers who choose to participate in the program, however, their returns over cash expenses would remain largely protected by the programs through a considerably higher deficiency payment (e.g., probably over $1.00 a bushel for corn, up from $0.48 for the 1985 program). In addition, a higher rate of program participation (e.g., as much as 85 percent for corn, up from nearly 70 percent in the 1985 program) anticipated for 1986 would further protect U.S. farmers' cash flow position. Therefore, even though a slightly larger percent of U.S. farmers may be adversely affected by lower commodity prices initially, their cash flow could conceivably be improved later as U.S. commodities become more competitive in world markets.

The following are based on average costs of production, which do not convey the skewed distribution of costs; i.e., many large producers have below average costs.

Our preliminary estimates for 1984 show that the very shortrun breakeven prices for corn and wheat were $2.03 and $2.71 per bushel, respectively. By very shortrun I mean payment of out-of-pocket cash expenses only (excluding any replacement of the farm's capital assets or any charge for land or labor). With a full accounting of all costs, the breakeven prices rose to $2.71 for corn and $4.09 for wheat.

We have also a preliminary estimate of costs and returns for 1985 and a forecast for 1986. Total costs for corn fell to $2.48 per bushel in 1985, and should fall again in 1986 to $2.44 per bushel. For wheat, 1985 costs increased to $4.47; in 1986, costs should be down to $4.21. These estimates are entirely dependent on the forecast yields, of course, and can change as yields change.

U.S. BREAKDOWN PRICES FOR WHEAT AND CORN

[Dollars per bushel]

Item	Corn			Wheat		
	1984	1985	1986	1984	1985	1986
Total cash expense	2.03	1.84	1.79	2.71	3.01	2.84
Cash expense with replacement	2.38	2.17	2.15	3.32	3.75	3.59
Economic costs excluding land [1]	2.24	2.07	2.05	3.23	3.67	3.51
Economic costs including land	2.71	2.48	2.44	4.09	4.47	4.21

[1] Economic costs include variable expenses, general farm overhead, taxes and insurance, capital replacement, and imputed returns to operating capital, other nonland capital, land, and labor.

Mr. WATKINS. The Secretary wants us to depend on the price in the world market and if we do, I am afraid we are not going to have any farmers left if we go to the world market price, as such.

I do not have any other particular questions and, Mr. Chairman, we have a vote.

Mr. AKAKA. Thank you very much, Mr. Watkins.

Because of time, I will submit the transition question to you.

Mr. Whitten.

RELOCATION OF ERS

Mr. WHITTEN. In fiscal year 1984 Congress appropriated $545,000 for ERS to relocate. This money was reappropriated in fiscal year 1985. What is the current status of your relocation and the use of these funds,

Dr. LEE. The first phase of the ERS Relocation began in May 1985. With the exception of the computer room, all offices were relocated by September 1985. The computer room was relocated in March 1986, completing the physical relocation of ERS. However, there are several pending actions related to the move yet to be funded, amounting to about $125,000.

USER FEES

Mr. WHITTEN. Do you charge user fees for any of your publications, and if so, which ones and how much do you collect?

Dr. LEE. We charge user fees for most of our publications. Fees are set by the Government Printing Office or by the Commerce Department's National Technical Information Service, through which all our for-sale reports are purchased. Annual sales volume approximates $200,000.

Mr. WHITTEN. Do you have any proposal currently pending to start charging user fees for any of your work or publications?

Dr. LEE. Yes. A new user fee program to enhance dissemination of ERS electronic information and data is being planned now. This data user services program is modeled on similar activities in the Bureau of the Census and the Bureau of Labor Statistics and will provide data tapes and personal computer "floppy disk" data files

to the public at the cost of reproduction. The program will also include reimbursable service agreements for the preparation of unique data tabulations requested by individuals or organizations.

Through this program, user fees will support a new ERS service to extend to the public the large and diverse agricultural economic data base assembled and maintained by our research activities. Moreover, it will supplement the sale of ERS reports through the Government Printing Office and the release of reports through the Department's electronic information system by providing both more extensive data than are currently published, and data in a form readily adapted to research and analysis. Stringent safeguards will protect data subject to the provisions of the Privacy Act or considered to be administratively confidential.

We expect to complete planning for our data user services program by May 1, 1986. Public release of data files will begin soon thereafter.

NEWSLINE

Mr. WHITTEN. Four years ago you advised the Committee that you were receiving 10,000 calls per month on Newsline. Three years ago you switched over to a user fee based on 50 cents per call. What impact has that had on the calls per month and the use on Newsline?

Dr. LEE. We discontinued the Newsline service in December 1982, following withdrawal of funding in FY 1982 for its parent project, the Farmers' Newsletters. Charges in the Newsline's latter days reflected a self-supporting effort through the telephone company's 900-line service. Calls diminished, but more importantly a required constriction on the time a message could be conveyed per call appreciably reduced the value of the information we could supply effectively through this medium.

ECONOMIC POLICY

Mr. WHITTEN. On page 23g–10 of the notes you state, "If export markets recover from the slow growth of the early 1980's and advance at average rates close to the long-run trend, agriculture will continue to grow. However, if they do not, there are two options: either rely again on sizable income transfer to avoid another depression in the agriculture economy about the size of the present one; or scale down the agricultural sector so that it, once again produces primarily for the domestic market." To what extent is current Administration policy a selection of the second option?

Dr. LEE. Administration policy has been determined primarily by the legislative authorities of the 1981 and 1985 Farm Bills. During the 1981 through 1985 crop years, there was a scaling down of the agricultural sector. Recession, foreign debt, a high value of the dollar, and uncompetitive U.S. prices contributed to a sharp drop in farm exports. Consequently, large acreage reduction programs were implemented to limit the surplus buildup. Between the 1982 and 1985 crop years, some 150 million acres of U.S. cropland were idled under Government programs. Were the U.S. to continue on a path of uncompetitive price support levels and maintain the current structure of funding for agricultural exports, the outcome would be eventual elimination of most commercial exports. Acre-

age reduction programs would have to be ever increasing to idle the resources that would otherwise have been used for export production.

Current Administration policy under the 1985 Food Security Act is an attempt to alter this progression to a domestic-dependent economy. The sharp drop in 1986 crop loan rates, combined with $5 billion in short-term credit funding, intermediate credit, targeted export assistance, and the export enhancement program, should make U.S. crops price competitive with those of foreign exporters. U.S. export share is likely to rise over the next few years. However, acreage reduction programs may be needed for a few years to bring current surpluses down.

It is possible that the combination of a fully implemented Acreage Conservation Reserve and some annual acreage reduction programs could result in more idled acres in future years than in most years during the 1970's and thus far during the 1980's. Whether this scaling down happens will depend on how fast foreign demand expands. The Administration policy, as evidenced by the 1986 programs, is one of reestablishing U.S. export price competitiveness in order to limit the idling of productive resources in the future.

Mr. WHITTEN. It would appear that this statement does not take into account any policy efforts to impact exports, such as offering U.S. products for sale in world markets at competitive prices. Should this be done, do your two options necessarily follow?

Dr. LEE. The policy choices of fostering commercial exports through competitive market prices or setting uncompetitive prices and producing for the domestic market assume export funding programs as embodied in the 1985 Farm Bill. Under the second option, some low-level of commercial exports would continue—those that could be maintained with the current credit and assistance programs. An alternative under this second policy option would be to embark on a wholesale, direct, and explicit export subsidy program where the Government would pay the difference between the high U.S price and the lower world price.

ERS has studied this export subsidy option and the results point out a number of problems with this approach. It would be very costly. For example, supporting U.S. wheat prices at $5.00/bu. as some have suggested would likely result in a per bushel export subsidy of at least $2.50 a bushel in the immediate future. The subsidy would have to be applied to all U.S. wheat exports for a total of $2.5–$3.0. billion per year for wheat alone. The per bushel subsidy would likely rise over time. When all other crops are added and some net loan outlays are included at the high loan rates, CCC outlays would likely be at least as great as under current programs.

Attempting to extract above-market prices from U.S. consumers while subsidizing foreign buyers would also cause sharp increases in consumer food costs, lower consumer food and fiber demand, lower livestock numbers, shifts to substitute feeds such as protein meals and roughages, elimination of large-scale cattle feedlots, and increases in imports of raw and processed products and substitutes. Moreover, such explicit export subsidies would run counter to U.S. attempts to promote global trade liberalization in agricultural and manufactured products. Retaliation and trade wars would be a likely result, which would greatly increase our program costs and

cause all exporting nations to lose. Finally, domestic consumers and food processors would likely be outraged at having their expenditures exorbitantly increased while foreign consumers were subsidized and CCC outlays on price support and related programs remained excessive.

Mr. WHITTEN. In the preceding paragraph of the notes you state, "ERS researchers found that the linkages between the farm economy and the national economy are so close that conditions beyond the farm gate can affect agriculture as much as farm programs." To what extent is the reciprocal of that statement true? What studies have you done to estimate how an agricultural recession would impact the entire national economy?

Dr. LEE. Farm programs certainly have effects beyond the farm gate, but the effects are not usually as important as those of, say, monetary policy changes. A successful export enhancement program adds nonfarm jobs in businesses involved in moving the farm products abroad. A successful domestic food program puts food in the stomachs of people who otherwise could not afford it. A major change in the government's monetary or fiscal policies, though, is likely to have a much broader impact on the typical nonfarm American.

Turning to your question about the impacts of an agricultural recession, I would not expect major impacts, particularly at present. Agricultural production today accounts for only about two percent of GNP. That means the U.S. economy is large enough to absorb a farm recession without major impacts outside of the sector itself and outside of communities which depend heavily on agriculture for jobs and income. There is also an important difference between the farm sector and manufacturing sectors. When demand slackens, manufacturers tend to reduce output and maintain price. In contrast, the farm sector maintains output and prices fall. This means that low demand in manufacturing sectors tends to produce layoffs, not only in the industry itself, but in its suppliers. Farmers may postpone some capital expenditures, but they do not typically lay off workers and they still have to buy their seed and other inputs. As a result, farm recessions tend to have less impact on the rest of the economy than do recessions in other sectors.

I do not want to leave the impression that I think all is well, however. The current situation in the farm sector is serious, and its impacts on individual farm families and agricultural communities have been devastating. While the effects on the overall economy may be comparatively small, the effects on some areas will be much more severe. There are some 700 counties in which farming accounts for a fifth or more of income. They are found throughout the U.S., but concentrated in the Dakotas, Iowa, Nebraska, Kansas, Missouri, and Texas, with a smaller group in the Mississippi Delta. Both businesses and local governments in those areas are likely to be hit much harder than the economy as a whole.

Mr. WHITTEN. To what extent does a prosperous agriculture impact the entire national economy?

Dr. LEE. In many ways, this question is the reverse of the previous one, and a short answer would be that agriculture is now too small a part of the general economy to prop it up if it is sagging. However, a prosperous agriculture certainly has positive effects on

the remainder of the economy, especially in farming communities. Farmers have more to spend, and Main Street businesses are particularly likely to feel the impacts of that income. The effects are also very important in the capital goods industries which produce farm inputs. Only transportation and communications are markedly more capital intensive than agriculture, and farmers tend to invest heavily when farm incomes are high and rising. In 1973, a year of record real net farm income, farm capital expenditures accounted for about 4.3 percent of the national total. Again in 1979, they were about 4.4 percent. On the other hand, in 1983 during a period of farm financial stress, the percentage was 2.6.

Mr. WHITTEN. To what extent is current farm policy based on rationing farmland downward in price? You cannot make money on $2.00 corn if the land costs $2,000.00 per acre; but if land costs $200.00 per acre, $2.00 corn is profitable. Such a policy would, of course, force many existing farmers out of business. To what extent has ERS studied this trend, which appears to be either policy or a consequence of policy?

Dr. LEE. One source of current problems in the farm sector is the fact that farmland values were bid to very high levels in the late 1970's and early 1980's based on optimistic expectations of future returns to farmland ownership. However, commodity prices were not the only factor driving land prices during this period. The very low real interest rates and widespread credit availability of the late 1970's encouraged purchasers to bid up farmland prices. When commodity prices weakened as a result of slowing demand growth and increased foreign competition in the 1980's, land prices also began to fall. Since 1981, the combination of high real interest rates and reduced inflationary expectations has also had a strong downward impact on farmland prices.

The Department of Agriculture does not have a policy that would try to deliberately set land prices; the land market handles this adjustment process. As you correctly point out, however, lower land prices will make it possible for American farmers to produce profitably at commodity prices that are competitive in world markets.

Mr. WHITTEN. As more and more farmland comes on the market, who is acquiring this land? To what extent has ERS studied this?

Dr. LEE. Historically, most farmland has been purchased by either active or retired farmers. In recent years they have accounted for two-thirds to three-quarters of all farmland acreage purchased. ERS is now analyzing returns from a February 1986 survey of farm brokers. Comments from the brokers and preliminary analysis of the data indicate that the historical relationship still holds—there does not appear to be any large changes in the proportion of land purchased by nonfarmers.

It is important to note that not all land that "comes on the market" is sold. In many cases, potential sellers receiving low bids simply reject the bids and retain ownership, e.g., in cases of distress sales where lenders offering property cannot obtain offers that will cover the existing debt.

I will submit a chart of farmland purchasers for the record.

[The information follows:]

DISTRIBUTION OF RECENT FARMLAND PURCHASERS

	Type of purchaser	
	Active or retired farmer	Nonfarmer
Year:	Percent	
1979	68	32
1980	67	33
1981	68	32
1982	75	25
1983	77	23
1984	76	24
1985	76	24

ERS STUDIES

Mr. WHITTEN. On page 23g-3 you state that two major research thrusts will be initiated in 1986: "A Study of Factors Affecting Short- and Long-Term Competitiveness of the United States in World Agricultural Markets;" and "Analysis of the Probable Foreign and Domestic Effects of Liberalizing World Agricultural Markets." One of the factors affecting competitiveness is the refusal to sell competitively. To what extent do you intend to study this?

Dr. LEE. Subsidized sales of Government-owned agricultural products is a policy factor here and abroad which has had an impact on our competitive position and as such much be considered in a study of competitiveness. But, the major thrust of the study will be the longer term prospects for the U.S. competitive position on the basis of market, rather than nonmarket, forces. Recent events in oil, airlines, and automobiles indicate that in the long-term market forces emerge to undermine efforts to sustain nonmarket conditions.

The study will, for example, address such questions as: Can the U.S. agricultural sector adjust quickly, and, if so, at what resulting level of output and input use? Which commodities, what geographical areas, and what input industries will be affected most? To what extent will other exporters adjust their output and input use?

Mr. WHITTEN. Your other study is the probable foreign and domestic effects of liberalizing world agricultural markets. To what extent will you be studying the impact of liberalizing imports of agricultural products and why?

Dr. LEE. In order to prepare for agricultural negotiations in the upcoming round of multilateral trade negotiations, ERS is currently collecting information on trade and domestic agricultural policies of major competitor and importing countries. ERS is also developing a world agricultural trade model from which the price and trade effects of alternative trade negotiation outcomes in the agricultural sector can be determined.

Liberalization of agricultural trade could affect U.S. farmers in two important ways. First, for commodities which are subsidized by U.S. competitors and/or which face restricted market access, trade liberalization could result in increased U.S. exports and higher market prices than without liberalization. Such commodities include wheat and rice and, to a lesser extent, cotton, coarse grains, and soybeans, which are less protected in international markets.

At the same time, in order to gain concessions in an MTN from competitors and trade partners, the United States will most likely be expected to liberalize U.S. markets for commodities such as dairy, beef, and sugar. Thus, this study must also consider the impacts of liberalizing U.S. imports. If other countries, especially the EEC, also free their markets, world market prices for these commodities could rise, thus allowing U.S. farmers to compete with imports at higher prices.

The global trade model developed by ERS will generate the impacts on world prices and traded quantities of alternative trade liberalization scenarios. ERS will also be able to calculate the effects on producers and consumers of agricultural commodities in the United States and foreign countries. Thus, the study will also estimate welfare transfers among countries resulting from alternative approaches to liberalizing world agricultural trade.

FINANCIAL CONDITION OF FARMERS

Mr. WHITTEN. On page 23g–5 you state, "The percentage of farms that are most likely to be experiencing financial stress (as measured by high ratios of farm debt to on-farm assets) increased from 18 percent in 1984 to 19 percent as of January 1, 1985." What is your best estimate of the figure as of January 1, 1986?

Dr. LEE. Estimates of financial stress as of January 1, 1986, will not be available until June 1986, from the ERS Farm Costs and Returns Survey that is now in the field.

Mr. WHITTEN. You go on to state that over 38,000 farms were technically insolvent, 55,000 had debt-asset ratios between 70 and 100 percent, and 121,000 farms had debt-asset ratios of 40 to 70 percent. What would that figure be as of January 1, 1986?

Dr. LEE. Data on farms by debt/asset ratio for January 1, 1986, will not be available until June 1986, from the ERS Farm Costs and Returns Survey that is now in the field.

FARM CREDIT

Mr. WHITTEN. For fiscal years 1986 and 1987 the Farmers Home Administration is budgeting a level of operating loans considerably below the actual level loaned in fiscal year 1985. In view of the fact that both the PCA's and the commercial banks are turning more and more farmers away, how do you view the outlook for credit during the remainder of fiscal year 1986 and into fiscal year 1987?

Dr. LEE. The 1986–87 authorizations for FmHA operating loans are about 25 percent below FY 1985 obligations. However, this contraction in FmHA funds is consistent with what we are observing through the farm sector. Based on preliminary estimates, it appears that farmers' demand for credit in the form of new loans declined about 25 percent between 1983 and 1985. Farmers' are cutting back on capital and production input purchases, and reducing their credit needs. However, some farmers that are now being denied credit by banks and PCA's are increasingly turning to

FmHA. In response, FmHA has shifted about $700 million from the emergency to the operating loan category.

Generally speaking, credit will be available to qualified farmers. Nationwide, commercial agricultural banks show strong loan to deposit ratios and continue to be very aggressive in searching for creditworthy customers. The banks and associations of the Farm Credit System have ready access to national money markets and will provide credit to those farming activities where they are assured a reasonable return. The Secretary of Agriculture has approved the advance diversion and deficiency payments to eligible producers of major commodities. This advance payment of about $4 billion will be a very timely source of funds to many farmers who would otherwise have been squeezed by a credit shortfall.

Lenders will be cautious in providing new loans where the repayment capacity of the borrower is uncertain. Many banks and units of the Farm Credit System have been forced to absorb large losses and liquidate non-performing loans as a means to protect their viability and continued service to farmers and rural borrowers. Recent legislation aiding the Farm Credit System and regulatory relief for commercial banks will be beneficial to the prospective farm borrowers.

TAX POLICY

Mr. WHITTEN. On page 23g–6 you state, "One study suggests that a significant share of investment in agricultural assets can be attributed to Federal income tax policy." In view of the current financial condition of farmers, what would happen if tax policy were changed to significantly impact investment in farms? You might respond to that both in terms of short-term impacts and long-term impacts.

Dr. LEE. Significant changes in tax policy, similar to those contained in the Administration's tax reform proposal, would result in a redistribution of the tax burden within the sector. Those farms and nonfarm investors who have made extensive use of preferential provisions would face increased tax liabilities. The competitive disadvantage faced by some farms as a result of the current tax system would be diminished. The enactment of major changes in the tax code would alter relative rates of taxation for various investments. This could result in changes in investment patterns and asset prices in the short run. However, an examination of the impact of tax reform on land prices concluded that there would be no significant impact. In the long run, incentives and opportunities to invest in agriculture will be diminished so that production capacity would adjust in the sector based on economic returns rather than tax considerations.

Mr. WHITTEN. On page 23g–7 you mention that livestock producers would pay more in taxes under the Administration's tax reform proposal. Why is that, and what would be the tax impact?

Dr. LEE. Under current law, livestock producers are permitted to claim immediate tax deductions for expenditures associated with raising all livestock, including those having a preproductive or development period of 2 years or longer. The Administration's tax reform proposal would require that these costs be capitalized and

recovered as tax depreciation deductions or subtracted from the price at time of sale to obtain the taxable gains. In addition, the special capital gains treatment for livestock used for draft, dairy, breeding, or sporting purposes would be repealed. These two changes in combination with other aspects of the proposal relating to the investment tax credit and depreciation policies, would more than offset rate reductions, increased personal exemptions, and standard deductions.

The tax impact would vary with the type of farm, the firm's financial structure, and many other factors. However, an examination of tax impact on representative hog and diary farms indicated Federal income tax liability could increase between $1,400 to $1,600. Not all livestock producers would face higher taxes, some would pay less or about the same.

POVERTY IN RURAL AREAS

Mr. WHITTEN. On page 23g–7 you state that high poverty levels persist for rural people, and you go on to state that poverty affects 18 percent of the nonmetropolitan population—the highest rate since the 1960's. You also state that poverty among nonmetropolitan children has undergone a dramatic rise. To whom, outside of USDA, did you provide the results of your findings?

Dr. LEE. Research on rural poverty is part of the Economic Research Service's ongoing program, hence, efforts are made to disseminate our findings on rural poverty to a broad audience, both inside and outside USDA. During the past two years, ERS distributed five reports containing information on rural poverty and/or chronically poor areas to public officials, the research community—including all land-grant universities—the press, and other individuals or organizations interested in rural areas. The Extension Service also distributed copies of these reports, and the Government Printing Office sold copies to the general public. The availability of ERS publications is listed routinely in a New Reports flyer circulated in Congress.

The research findings were also distributed through other sources. For example, articles appeared in Rural Development Perspectives, an ERS magazine with a circulation of 2,800. The circulation includes State and local governments, planning agencies, policy officials, and universities. Rural poverty information also appears annually in the Agricultural Chartbook distributed outside USDA by ERS, the Extension Service, and GPO sales. Finally, ERS maintains data on rural poverty to answer inquiries by USDA officials, the public, Congress, and other government officials.

Mr. WHITTEN. Are you aware to what extent the results of your findings were used as part of the budget determinations to terminate rural assistance programs?

Dr. LEE. We are unware of the extent to which the Economic Research Service's research results were utilized in budget deliberations for programs affecting rural areas. As previously indicated, however, ERS information is distributed to a diverse audience, including policy officials in all three Branches of government and at the Federal, State, and local level. Our findings show that, contrary to the popular conception of poverty as an urban problem,

poverty actually is more severe in rural—nonmetropolitan—areas, even after in-kind benefits are taken into account. In addition, the rate of poverty for people living on farms increased by 10 percentage points between 1973 and 1983. Many of the farm and nonfarm rural poor live in isolated areas, and, thus, may have more limited access to job opportunities, services, programs, and aid than the urban poor.

HISTORY OF RURAL AND AGRICULTURAL POLICIES

Mr. WHITTEN. On page 23g-8 you mention that ERS historians have studied the history of rural and agricultural policy. Would you please provide the Committee with a copy of this study.

Dr. LEE. Yes, we will send copies of "90 Years of Rural Development Programs" and "History of Agricultural Price-Support and Adjustment Programs, 1933-84" directly to the Committee.

FOOD NEEDS AND AVAILABILITIES REPORT

Mr. WHITTEN. On page 23g-10 you discuss the Food Needs and Availabilities Report. Would you please provide the Committee with a copy of this report, as well as placing the Committee on regular distribution for this report?

Dr. LEE. Yes, we will send copies of World Food Needs and Availabilities, 1985, and the quarterly supplements directly to the Committee members, and place the Committee on our distribution list for these reports.

DAIRY PROGRAM

Mr. WHITTEN. On page 23g-11 you make the statement that, "A one percent rise in feed costs decreases milk production by an estimated 0.16 percent over a four-year period." To what extent will the lower prices that will result from the Farm Bill increase total milk production, thereby impacting on programs established in the Farm Bill to lower milk production?

Dr. LEE. Concentrate—grain—costs account for about one-third of total cash costs of milk production. Therefore, feed costs are an important factor in evaluating the economic well-being of dairy farmers and the likely effectiveness of the programs established in the Farm Bill to lower milk production.

Several factors under the dairy portion of the Farm Bill are designed to lower milk production. The support price for manufacturing grade milk during 1986 required by the Food Security Act of 1985 will be $11.60 per cwt. This resulted in the support level during the first-quarter 1986 being $1 lower than a year earlier. The level in the second quarter will be 50 cents lower than 1985 and in the second-half 1986 the level will be even with second-half 1985. The level of support will be reduced 25 cents on both January 1 and October 1, 1987. On January 1, 1988, and thereafter, adjustments in support prices will be determined by projected CCC acquisitions of surplus dairy products. If surplus purchases are projected to be greater than 5 billion pounds, the support price will be cut 50 cents per cwt. If surplus purchases are less than 2.5 billion pounds, the support price will be increased by 50 cents per cwt.

The Food Security Act also requires a 40 cents per cwt deduction from April 1 through December 30, 1986, and a 25-cent deduction from January 1, 1987, to September 30, 1987, to help finance a dairy termination program. In addition, to carry out the provisions of Gramm-Rudman-Hollings, the CCC is expected to have a deduction of up to 12 cents per cwt from April 1 through September 30, 1986.

Provisions of the 1985 Farm Bill will probably lower concentrate prices around 10 percent throughout the 1980's compared to what prices would have been under the 1981 Act. This would tend to increase milk production about 2 percent over levels expected without a change in concentrate costs and make it even more difficult to achieve a supply-demand balance in the dairy sector. However, the price support reductions described above and the effects of the dairy termination program will more than offset effects of the drop in feed concentrate costs, reducing excess milk production from the 1985 levels.

RESEARCH NEEDS

Mr. WHITTEN. In carrying out your various economic research studies, how closely do you work with the Agricultural Research Service and the Cooperative State Research Service to relay to them fields of agricultural research you feel may need attention? In other words, how do the two agencies coordinate their programs?

Dr. LEE. ERS interacts and coordinates with the Agricultural Research Service and the Cooperative State Research Service in many ways. The most recent direct link with ARS has been through the assignment of Dr. Ira Branson, senior ARS scientist, to ERS for 15 months. In this assignment, Dr. Branson identified the ARS needs for economic research and worked with the ERS leadership to develop strategies to undertake these studies. In addition, ERS shares information with ARS, CSRS, and others on its priorities. A recent report titled "ERS in Transition" provides information on the focus of ERS research for the balance of the decade. Drafts of this document were reviewed and discussed with ARS and CSRS and the 1890 schools before finalization. ERS also actively participates with ARS and CSRS on the Joint Council for Food and Agricultural Sciences in identifying research needs and priorities. ERS maintains a liaison relationship and shares planning information with the four regional associations of State Experiment Station Directors. ERS also participates in specific cooperative projects with ARS and the Experiment Stations on subjects of mutual interest.

CONSERVATION

Mr. WHITTEN. On page 23g–15 you state off-site benefits account for about two-thirds of the total benefits from cropland erosion control, indicating that significant benefits from soil conservation programs accure to the public in addition to benefits to private landowners. This would appear to be a strong statement in support of the conservation programs that the fiscal year 1987 budget proposes to terminate. For an agricultural conservation program of

$190 million, what is the benefit to the farmer and what is the benefit to the public-at-large?

Dr. LEE. Our analysis of erosion control programs has been confined to cropland. We estimate long-term soil productivity benefits of about $100 million and off-site damage reduction benefits in the range of $104 to $261 million from the three major USDA programs, CTA, ACP, and GPRC. These benefits result from public and private erosion control expenditures of $419 million—$200 million public and $219 million private. Existing data make it difficult to estimate all of the short-run costs and benefits that farmers incur in applying conservation practices, and the estimates may not include all production benefits associated with conservation practices. Our study also finds that the returns to convervation investments could be increased significantly if the investments were directed to land eroding at 15 tons per acre or more.

Mr. WHITTEN. You state, "The use of variable cost-share rates, based on the amount of erosion reduction achieved, has good potential for increasing the effectiveness of public conservation expenditures." Does the new Conservation Reserve Program provide for variable cost-share rates?

Dr. LEE. The Conservation Reserve uses a bid system to select land for inclusion in the program. This system allows payments for idling land to vary between farms, just as payments vary under the variable cost-share program.

While the 1986 Conservation Reserve Program will accept the lowest cost-per-acre bids first, the Conservation Title in the 1985 Food Security Act gives the Secretary of Agriculture some latitude to consider other goals such as obtaining the most erosion reduction per dollar spent, or to achieve the largest reduction in surplus crop output per dollar. The experience from the implementation of the future Conservation Reserve in 1986 may therefore suggest changes in bid selection formulas for the coming years. Such changes may make the Conservation Reserve Program even more comparable to the variable cost-share program for achieving soil conservation.

Mr. WHITTEN. You state, "A study of the effects of sodbusting found that the practice is not adding greatly to current soil losses." Would you please expand on that statement and your findings?

Dr. LEE. In analyzing the erosion potential of land converted to cropland between 1979-81, ERS found that 1 acre in 5 was classified as highly erodible, compared with 1 acre in 10 for cropland generally. Given the less intensive use of new cropland, it accounted for 2.6 percent of total acres in 1982 and 2.9 percent of the estimated soil loss. However, given the greater erosion potential of new cropland, more intensive use in the future could boost actual erosion rates.

Our analysis indicates that prohibiting farm program subsidies on recently converted highly erodible cropland would remove incentives for conversion and ensure greater consistency between conservation and commodity programs. For such legislation to be

fully effective, more precise identification of highly erodible land may be needed.

LANGUAGE CHANGES

Mr. WHITTEN. You are proposing to delete some language which has appeared in the appropriation bills for many years now on the basis that your expenditures will far exceed the floors that are established in the bill language. How much would you estimate of your total appropriation is used to gather statistics to conduct a special study on the price spread between the farmer and the consumer?

Dr. LEE. Approximately $400,000 of direct ERS appropriations are used to conduct that study. The statistics, however, are obtained from surveys conducted by the Bureau of the Census, Bureau of Labor Statistics, and USDA's Statistical Reporting Service. Those surveys provide statistics on many other items, so it's impossible to separate out the cost of the data we use, but that cost far exceeds the $350,000 floor established in the appropriations language. Incidentally, we issue a report on that study annually. A copy of the executive summary of this year's study has been sent to each member of this Committee, as it has in past years.

Mr. WHITTEN. How much do you expect to expend during fiscal years 1986 and 1987 for analysis of statistics and related facts on foreign production and full and complete information on methods used by other countries to move farm commodities in world trade on a competitive basis?

Dr. LEE. Approximately one-fourth of the total ERS appropriation will be expended on our international economics program, which, in general terms, comprises those very activities.

Mr. WHITTEN. Your are also proposing to alter the language regarding studies related to findings of the Environmental Protection Agency. Your proposed language would state: "The funds are available for the purpose of reviewing and investigating. . . ."; whereas language which has appeared in the bill for many years deals with "investigation, determination, and presentation." Why have you avoided the word "presentation"?

Dr. LEE. Mr. Chairman, that wording change was proposed by the Office of Management and Budget's legal counselors for the purpose of eliminating redundant language. Absolutely no change in the intent of the original words is intended. Results of our analysis will continue to be "presented" or reported.

TRANSFERS OF FUNDS

Mr. WHITTEN. Last year you transferred $112,000 to the Office of Governmental and Public Affairs. What was the purpose of this transfer?

Dr. LEE. ERS was assessed $112,000 for its "share" of OGPA activities not funded by direct appropriations, including the USDA Employee Newsletter, Visitor Information Center, TV Production, Dialcom, Public Liaison, Photo Center Support, and Photo Composition Unit. OGPA has requested direct appropriations for these items in its 1987 budget estimate.

Mr. WHITTEN. If the funds were transferred, were any positions transferred?

Dr. LEE. The funds were transferred but no positions were transferred.

Mr. AKAKA. I want to thank you very much, Mr. Secretary, and Mr. Administrator for your testimony. And again, I will repeat, we will post your testimony in the record.

Thank you.

Mr. LEE. Thank you very much.

ECONOMIC RESEARCH SERVICE

Statement of John E. Lee, Jr., Administrator, before the House Subcommittee on Agriculture, Rural Development, and Related Agencies.

Mr. Chairman and members of the Committee, I'm glad to have this opportunity to appear before you to present our proposed budget for 1987.

Need for Economic Analysis

When you are faced with cutting Federal programs to achieve reductions in the Federal budget deficit, the need for economic analysis is critical. One of our main purposes is to provide economic analysis and data that are essential inputs into economic decisionmaking--at the national policymaking level as well as at the firm and individual levels. In fiscal year 1986 USDA's programs involve over $70 billion per year in either direct outlays or in loan guarantees. Those increasingly complex and interrelated programs require rigorous analysis. ERS's research and analytical programs that undergird decisions on USDA's programs are currently funded at a level that is about one-twentieth of one percent of the overall program level of the Department.

Mission of the Economic Research Service

U.S. agriculture and rural America have gone through changes of unprecedented magnitude in the past four decades. Agricultural markets have been internationalized. Rural America is no longer primarily agrarian. Farms are fewer and larger. Highly capitalized farms using sophisticated technology have replaced the millions of smaller, capital-short family farms that once dominated U.S. farming.

Those changes have far-reaching implications for agricultural policy, raising questions about the appropriate role and objectives of government programs in agriculture, natural resources, and rural America, and about how those increasingly complex programs affect the efficiency and profitability of farm firms and rural enterprises and the well-being of rural residents.

Providing an economic and social science information base for addressing those questions--indeed, for ensuring that the important questions are raised--is the primary mission of the Economic Research Service.

Programs of the Economic Research Service

Agriculture and Rural Economics Program

The Agriculture and Rural Economics Program focuses on national and regional rural and agricultural trends and conditions. The Program covers a broad range of topics, including financial problems in the farm sector; import competition affecting agriculture and rural manufacturing; how the Nation's macroeconomy (the Federal budget deficit, deregulation of financial institutions, and proposed changes in Federal income taxation) impacts on agriculture and rural America; differences in economic performance between urban and rural areas; rural population growth; persistent rural poverty; the industrial restructuring of the rural economy (especially the growth of the service sector); agricultural labor, credit, and finance and their structural implications for agriculture and the rural economy; and immigration and the market for agricultural labor.

International Economics Program

The International Economics Program is the primary national and international source of expertise, data, models, and research on the agricultural economies and policies of foreign countries and their agricultural trade and development relationships with the United States. The Program covers the economic, technical, and political factors that affect agricultural trade among countries, including weather and technical production systems; commodity and financial market structure, efficiency, and performance; and foreign government policies on production, consumption, finance, and trade.

Domestic Food and Fiber System Program

The Domestic Food and Fiber System Program includes current market intelligence, policy analysis in support of public decisionmaking, and economic research on the U.S. food and fiber system. The Program covers crops, livestock, fruits, vegetables, and sweeteners; farm inputs, costs, and returns; farm and food marketing; farm and food technology impacts; and food consumption and prices.

Natural Resource Economics Program

The Natural Resource Economics Program covers agricultural resources, with primary emphasis on soil, water, land, and environmental issues. The research encompasses analyses of supply of, demand for, and prices of agricultural resources; agricultural resource conservation and environmental programs; and agriculture's effects on resource use and the natural environment.

Some Examples of What the Economic Research Service Does

Farm Financial Conditions

Don Paarlberg, a former chief economist at USDA, said ERS has a responsibility to provide an "honest mirror" for rural America. To that end, ERS monitors financial conditions in the farm sector and tries to provide a balanced perspective on those conditions. ERS has given high priority to compiling better information on the number, location, and characteristics of farmers and lenders experiencing inordinate financial stress.

As a result of our surveys and analyses, it is now rather common knowledge that the "financial crisis" is heavily concentrated in about 13 percent of our producers. Those farmers hold about 40 to 45 percent of operator debt, tend to be cash grain and livestock producers, and live disproportionately in the Corn Belt, Lake States, Great Plains, and parts of the Delta and Southeast.

We also know that most of those stressed producers incurred large debts for a variety of reasons--drought, farm expansion, etc.--and needed either a continuation of rapid inflation or rapidly rising commodity prices to remain viable. A dramatic deterioration in global economic conditions reduced prospects for exports, hence prospects for rapid growth in farm incomes, hence the perceived value of land. With the turnaround in land values, the heavily-leveraged producers were caught out on a limb.

Paradoxically, net cash income--the measure that best reflects debt repayment ability for the sector as a whole--has been on a historically high plateau since 1973, was a record high in 1984, followed by a new record high in 1985, and will likely continue to be near those levels in 1986. The high incomes reflect larger volumes of production, lower production costs, and much larger Federal payments that combined to offset lower

commodity prices. The "average" household income from farm (84 percent) and nonfarm (16 percent) sources of farms with sales of $100,000 to $500,000--the mainstream commercial family farms--was $55,000 in 1984. Yet, within that group, some are hopelessly in debt and faced with the loss of their farms.

Those seemingly incongruous observations reflect the diversity of conditions in agriculture today and present a confused picture to the public and to policymakers. ERS has stepped up its efforts to sort out that confusion and to provide more useful information to policymakers. If ERS does not do this, it simply will not be done.

The tenuous financial condition of many farm lenders is underscored by the findings of ERS analysts that a disproportionately large share of farm operators' debt was owed by the farms experiencing financial stress. Of those farm loans that were not fully serviceable in 1985, 32 percent were owed to the Farm Credit System, 18 percent to the Farmers Home Administration, 26 percent to commercial banks, and the remainder to individuals and other lenders. Agricultural bank failures numbered 7 in 1983, 31 in 1984, and 70 in 1985. Nonetheless, an ERS study of the incidence and consequences of rural bank failures found that few rural counties experienced loss of

banking services because of a bank failure. In most cases, the failed institution reopened under new ownership and continued providing banking services to the community. Nor do the problems of agricultural banks appear to pose any major threat to the viability of the overall banking system.

Demand for U.S. Agricultural Exports

ERS economists evaluated the more significant policies employed by the United States and other major trading countries that affect U.S. exports. Commodity price and income policies, trade policies (such as embargos, subsidies, credit, and food aid) and the effects of exchange rates and debt repayment options were included. The costs of domestic and trade policy interventions, as measured by government expenditures on agriculture, were compared for the United States and other countries. Japan and the United States are ranked at the top of the list. Price and income supports comprise the largest amount of assistance for both countries. Much of the support for agriculture, however, is through other means. The European Community (EC) and Japan can raise prices to producers simply by restricting imports. The direct budgetary costs of those interventions may be negligible but the subsidy effect very large. ERS researchers found, however, that apart from the EC,

U.S. competitors are providing less assistance to their producers in the form of direct producer subsidies than is commonly perceived to be the case.

In 1985, ERS initiated a multiyear study on the competitiveness of U.S. agriculture vis-à-vis agriculture in other countries. ERS economists outlined the issues and problems concerning U.S. competitiveness in world markets. Exporting countries' trade and agricultural policies were identified. A large data base documenting those policies was developed tc assess the trade barriers and export subsidies by U.S. competitors.

Agriculture in an Open Economy

ERS researchers found that the linkages between the farm economy and the national economy are so close that conditions beyond the farm gate can affect agriculture as much as farm programs. Business cycles are no longer confined to national economies; they are international. Since farm exports depend so heavily on economic conditions abroad, global business cycles have a major effect on the demand for U.S. farm products. The net result of those developments is that national and international economic forces influence farmers' production

costs, the demand for their products, their competitiveness in domestic and international markets and, ultimately, their income levels and wealth.

The importance of agricultural trade to the economy as a whole is illustrated by other information compiled by ERS: each dollar earned from agricultural exports stimulates another $1.37 of output in the U.S. economy; approximately 80 percent of that additional economic activity accrues to the nonfarm sector; over 1 million jobs are related to U.S. agricultural exports.

Policy Analysis

ERS conducted analyses for Department officials of the economic effects of the suspension of prorates on navel orange prices, producer incomes, handler marketing practices, and marketing orderliness. Another analysis considered the implications of a continuation of the navel orange prorate suspension for production, utilization, and prices, and assessed the implications for growers, handlers, and consumers.

A Congressionally-mandated study by ERS provides an example of an alternative dairy price-support mechanism that would have performed better than parity during the past decade. The

mechanism consists of three major parts: an index of weighted prices of milk production inputs and the consumer price index, a longrun adjustor of the 10-year moving average of real prices, and a shortrun adjustor that slides over a discretionary range based on the level of recent surplus. That study found that use of that alternative mechanism probably would not have eliminated either the price volatility of 1973-75 or the surplus of the early 1980's. But the magnitude of both could have been greatly reduced. The mechanism would have required significantly higher support prices during the price trough between mid-1974 and mid-1975, which likely would have curbed the sharp market price response of late 1975. The mechanism would have raised support prices much less at the start of the 1979/80 and 1980/81 marketing years. Since October 1981, the minimum support level would have been virtually frozen at a level well below actual support levels. Both a quicker response to the developing surplus and lower support prices would have held down surpluses during the early 1980's.

In another mandated study, ERS researchers concluded that, among selected States, release of farmer-owned reserve stocks appeared to materially lower the State's monthly grain prices relative to the U.S. average. That situation was limited to corn in Nebraska and Kansas and wheat in Oklahoma and Washington.

The researchers also concluded that adjusting the 5-day moving average prices based on production-weighted and reserve-weighted daily prices as alternatives did not differ greatly from the simple average mechanism currently used by the Agricultural Stabilization and Conservation Service to determine release status.

Natural Resources

In 1985, ERS economists closely monitored the effects of high interest rates and reduced credit availability on U.S. agricultural resource values and uses. The annual ERS Agricultural Land Values Survey revealed that farmland values declined 12 percent from April 1984 to April 1985. That drop was the largest since the early 1930's. The largest declines occurred in the Corn Belt, Lake States, and Northern Plains, where farmland values dropped by 20 percent or more.

An ERS study of USDA erosion control programs revealed that economic benefits of protecting soil productivity and preventing offsite damages are less than the public and private expenditures for erosion control on cropland. The benefit-cost ratio exceeds 1.0 on cropland eroding at over 15 tons per acre per year. No appreciable differences were found in the benefit-cost ratios of

the three major erosion control programs of USDA. Offsite benefits account for about two-thirds of total benefits from cropland erosion control, indicating significant public benefits from soil conservation programs. Improvement in conservation program efficiency could be obtained by redirecting resources to land eroding at over 15 tons per acre.

A variety of behavioral and programatic factors were identified as sources of potential improvement in the performance of soil conservation programs. Based on analysis of landownership data from ERS's Resource Economics Survey, ERS economists have challenged the conventional view that farmers are more concerned about erosion on land they own than on land they rent. Conservation management practices used by farmers on rented land compare favorably with those on owned land. The researchers conclude that leased cropland should not be treated differently from owned cropland in the design of public soil conservation policy.

Targeting USDA erosion control efforts increases the effectiveness of Federal investments in erosion control programs. Farmers increased their use of SCS technical assistance and ASCS cost-sharing in four States targeted by USDA in 1981-82. The rate of adoption of erosion control practices, especially

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conservation tillage, was accelerated in all four States. Reductions in soil loss followed. Long-term agricultural productivity increased in three of the four States. Use of variable cost-share rates, based on the amount of erosion reduction achieved, has good potential for increasing the effectiveness of public conservation expenditures.

ERS analyzed various policies that were proposed for the combined purposes of conserving soil and reducing surplus commodity production. Long-term acreage retirement and conservation-oriented commodity programs have potential for increasing soil conservation while reducing surplus crop production. Commodity programs have tended to discourage conservation. Retirement of land based only on the criterion of having the highest erosion rates would save the most soil but cost the government more than other retirement options. Retirement of surplus corn acres targeted to highly erodible land could be cost-effective for both conservation and commodity program objectives. Cross-compliance would not promise widespread conservation benefits and might reduce commodity program effectiveness, but compliance incentives and modest changes in commodity programs could complement other soil protection measures.

ERS analyzed a variety of options for implementing a conservation reserve program, focusing on their effects on both soil conservation and farm program costs. The estimated economic effects of conversion are very sensitive to expectations regarding crop yields and prices. However, conservation reserve programs seem likely to reduce total government costs by providing a less expensive way to retire cropland acreage.

An ERS study concluded that removing pesticides with alleged environmental and safety risks from the market could increase U.S. agricultural production costs, crop prices, farm incomes, and consumer expenditures for food. The effects will not be uniformly distributed. Farmers relying on the affected pesticides could be faced with using higher cost pest control alternatives. Banning all materials in a group of pesticides would have the most severe effects, while banning an individual pesticide would not significantly affect crop yields or production costs.

ERS evaluated the economic impacts of the Boll Weevil Eradication Program conducted on 40 thousand acres of cotton in North Carolina. Cotton insect control expenditures dropped from an average of $51 to $17 per acre. Overall, the Boll Weevil Eradication Program increased profits for cotton growers. Cost-

shared boll weevil eradication efforts now are proceeding in the Carolinas and Georgia.

1987 Budget Estimate

We propose a budget of $45.5 million for 1987, which is a decrease of $552,000 from our 1986 appropriation prior to the 4.3-percent sequester. Our staff ceiling is reduced by 30 staff-years. We plan to minimize the impact of that reduction on our program through greater efficiencies to be achieved by streamlining management and increasing computerization of our data bases and analytical models.

The main point I want to make today is that an increasingly complex agricultural sector (due to its links to trade and the global macroeconomy) requires rigorous economic analysis.

Thank you again for this opportunity to testify before this Committee. I will be pleased to try to answer your questions.

ECONOMIC RESEARCH SERVICE

Purpose Statement

The Economic Research Service (ERS), originally established in 1961 principally under the authority of the Agricultural Marketing Act of 1946 (7 U.S.C. 1621-1627), was reestablished as a separate agency in USDA on September 30, 1981, by the Secretary of Agriculture.

ERS serves the critical need for timely and reliable agricultural economic information (research, forecasts of major agricultural economic indicators, policy analysis, and data) that addresses the multitude of economic concerns and the decisionmaking needs of farmers, consumers, extension workers, private analysts, processors, marketers, input suppliers, and policy officials in the Federal Government, Congress, and State and local governments.

ERS conducts research cooperatively with other publicly funded research institutions--primarily other federal agencies and State universities. Principal agencies requesting reimbursable work by ERS are the Soil Conservation Service, Agricultural Stabilization and Conservation Service, Forest Service, Food and Nutrition Service, Animal and Plant Health Inspection Service, Foreign Agricultural Service, Agency for International Development, and Environmental Protection Agency.

Headquarters of ERS are in Washington, D.C. Economic analysis and research are conducted both in Washington, D.C., and 20 States, primarily at land-grant universities. As of September 30, 1985, ERS had 808 permanent full-time employees and 57 part-time employees, including 764 permanent full-time employees and 53 part-time employees located in Washington, D.C.

ECONOMIC RESEARCH SERVICE

Available Funds and Staff-Years

1985 Actual and Estimated, 1986 and 1987

Item	1985 Actual		1986 Estimated		1987 Estimated	
	Amount	Staff-Years	Amount	Staff-Years	Amount	Staff-Years
Economic Research Service	$47,008,000	826	$45,958,000	869	$45,475,000	850
Obligations under other USDA appropriations:						
Agricultural Marketing Service for study of marketing of U.S. agricultural products	20,000	--	30,000	--	30,000	--
Agricultural Research Service for study of policy options on conservation	20,000	--	--	--	--	--
Agricultural Stabilization and Conservation Service for the rural clean water program	290,579	5	365,000	6	52,000	1
Animal and Plant Health Inspection Service for study of plant quarantine regulations	7,652	--	8,000	--	8,000	--
Cooperative State Research Service for history of Experiment Stations	50,000	1	50,000	1	--	--
Extension Service for study of State and local government role in rural development	45,577	1	--	--	--	--
Federal Grain Inspection Service for wheat reporting study	20,000	--	--	--	--	--
Food Safety and Inspection Service for health information systems study	91,500	--	--	--	--	--
Foreign Agricultural Service for international trade studies	39,500	1	30,000	--	--	--
Office Rural Development Policy for State Financial programs study	20,000	--	--	--	--	--
Soil Conservation Service for economic research on watersheds and river basins	606,140	5	295,000	6	110,000	3
Various USDA Agencies for agency support of Great Plains Council programs	31,644	1	--	--	--	--
Total, Other USDA Appropriations	1,242,592	14	778,000	13	200,000	4
Total, Agriculture Appropriations	48,250,592	840	46,736,000	682	45,675,000	854

Item	1985 Actual		1986 Estimated		1987 Estimated	
	Amount	Staff-Years	Amount	Staff-Years	Amount	Staff-Years
Other Federal Funds:						
Commerce, Department of, for employment and rural business studies	165,000	--	--	--	--	--
Forest Service for planning toward year 2005	24,835	--	48,000	1	--	--
Interior, Department of, for reclamation projects study	29,060	--	--	--	--	--
National Instutite of Mental Health for study of health demographics profile system	38,000	--	--	--	--	--
Office of International Cooperation and Development for personnel details and food aid studies	1,019,927	25	733,000	19	700,000	18
Tennessee Valley Authority for automated data processing support	--	--	10,000	--	--	--
U.S. Congress for dairy and food irradiation study	500	--	--	--	--	--
Total, Other Federal Funds	1,277,322	25	791,000	20	700,000	18
Non-Federal Funds:						
Miscellaneous Contributed Funds for American Agricultural Economics Association support	25,177	1	8,000	--	--	--
Total, Non-Federal Funds	25,177	1	8,000	--	--	--
Total, Economic Research Service	49,553,091	866	47,535,000	902	46,375,000	872

Full-time Equivalent Staff-Years:	1985 Actual	1986 Estimated	1987 Estimated
Ceiling	866	902	872
Non-ceiling	--	--	--
Total	866	902	872

ECONOMIC RESEARCH SERVICE

CLASSIFICATION BY OBJECTS

1985 and Estimated 1986 and 1987

	1985	1986	1987
Personnel Compensation:			
Headquarters	$26,045,227	$28,834,000	$28,700,000
Field	2,715,946	854,000	342,000
11 Total personnel compensation	28,761,173	29,688,000	29,042,000
12 Personnel Benefits	3,457,399	3,650,000	3,580,000
13 Benefits for former personnel	170,828	274,000	126,000
Total Pers. Comp. & Benefits	32,389,400	33,612,000	32,748,000
Other Objects:			
21 Travel	661,467	835,000	835,000
22 Transportation of things	81,831	49,000	49,000
23.2 Communications, utilities and other rent	1,015,942	978,000	978,000
24 Printing and reproduction	581,197	403,000	403,000
25 Other services	9,258,731	9,099,000	9,480,000
26 Supplies and materials	499,182	377,000	377,000
31 Equipment	1,619,487	605,000	605,000
Total other objects	13,717,837	12,346,000	12,727,000
Total direct obligations	46,107,237	45,958,000	45,475,000
Position Data:			
Average Salary, ES positions	$67,158	$67,775	$68,392
Average Salary, GS positions	$34,882	$34,882	$34,882
Average Grade, GS positions	10.7	10.7	10.7

ECONOMIC RESEARCH SERVICE

The estimates include appropriation language for this item as follows (new language underscored; deleted matter enclosed in brackets):

Economic Research Service:

For necessary expenses of the Economic Research Service in conducting economic research and service relating to agricultural production, marketing, and distribution, as authorized by the Agricultural Marketing Act of 1946 (7 U.S.C. 1621-1627), and other laws, including economics of marketing; analyses relating to farm prices, income and population, and demand for farm products, use of resources in agriculture, adjustments, costs and returns in farming, and farm finance; research relating to the economic marketing aspects of farmer cooperatives; and for analyses of supply and demand for farm products in foreign countries and their effect on prospects for United States exports, progress in economic development and its relation to sales of farm products, assembly and analysis of agricultural trade statistics and analysis of international financial and monetary programs and policies as they affect the competitive position of the United States farm products; [$46,305,000] $45,475,000 of which not
1 less than $200,000 shall be available for reviewing and investigating the effect of proposed actions pending before the Administrator of the Environmental Protection Agency upon the production of food and the agricultural economy: [investigation, determination and finding as to the effect upon the production of food and upon the agricultural economy of any proposed action affecting such subject matter pending before the Administrator of the Environmental Protection Agency for presentation, in the public interest, before said Administrator, other agencies or before the courts: Provided, That not less than $350,000 of the funds contained in this appropriation shall be available to continue to gather statistics and conduct a special study on the price spread between the farmer and the consumer:] Provided further, That this appropriation shall be available for employment pursuant to the second sentence of section 706(a) of the Organic Act of 1944 (7 U.S.C. 2225)[: Provided further,
2 That not less than $145,000 of the funds contained in this appropriation shall be available for analysis of statistics and related facts on foreign production and full and complete information on methods used by other countries to move farm commodities in world trade on a competitive basis].

The two changes in language are to clarify the wording without changing the intent of the language and to delete redundant prescriptions. Price spreads analysis is covered under "economics of marketing" and foreign production and trade analysis is covered under "analyses of supply and demand for farm products in foreign countries and their effect on prospects for United States exports" at levels that will far exceed the prescribed minimums given the total level of appropriation.

Economic Research Service

Appropriations Act, 1986		$46,305,000
Budget Estimate, 1987		45,475,000
Decrease in Appropriation		-830,000
Adjustments in 1986		
Appropriations Act, 1986	$46,305,000	
Less pro-rata reduction, P.L. 99-190	-278,000	
Net Appropriations	46,027,000	
Activities transferred from Agricultural Marketing Service a/	+70,000	
Transfer to Departmental Administration and Office of Governmental and Public Affairs for Reimbursable Activities b/	-139,000	
Adjusted base for 1986		45,958,000
Budget Estimates, 1987		45,475,000
Decrease over adjusted 1986		-483,000

a/ Pursuant to an agreement between Agricultural Marketing Service and Economic Research Service approved on July 19, 1985, the Office of Agricultural Labor Affairs is transferred from Agricultural Marketing Service to Economic Research Service.

b/ A transfer of $27,000 to Department Administration and $112,000 to Office of Governmental and Public Affairs is to fund activities previously financed on a reimbursable basis as a direct appropriation in FY 1987.

SUMMARY OF INCREASES AND DECREASES
(On basis of adjusted appropriation)

Item of Change	1986 Estimated	Decrease	1987 Estimated
Economic Analysis and Research	$45,958,000	-$483,000	$45,475,000

PROJECT STATEMENT
(On basis of adjusted appropriation)

	1985 Actual		1986 Estimated			1987 Estimated	
	Amount	Staff-Years	Amount	Staff-Years	Increase or Decrease	Amount	Staff-Years
1. Economic Analysis and Research	$46,107,237	826	$45,958,000	869	-$483,000	$45,475,000	850
Unobligated balance	900,763	--	--	--	--	--	--
Total available or estimate	47,008,000	826	45,958,000	869	-483,000	45,475,000	850
Reappropriation of 1984 moving costs	-545,000	--	--	--			
Transfer from Agricultural Marketing Serv.	-49,000	-1	-70,000	-2			
Transfer to Departmental Administration	+27,000	--	+27,000	--			
Transfer to Office of Governmental and Public Affairs	+112,000	--	+112,000				
Total, appropriation	46,553,000	825	46,027,000	867			

EXPLANATION OF PROGRAM

The appropriation for the Economic Research Service funds the activity principally authorized by the Agricultural Marketing Act of 1946, as follows:

-- Economic analysis and research - This activity includes agricultural economic and other social science research, outlook forecasting, policy analysis, and data collection and management related to U.S. and international agriculture, natural resources, and rural America. The economic information is produced to address the multitude of economic concerns and decisionmaking needs of policy officials in the Congress and Federal, State, and local governments, farmers, extension workers, private analysts, processors, marketers, input suppliers, and consumers.

OIG Report #50-563-57-AT 12/5/85 Audit of research program at University of Tennessee.

JUSTIFICATION OF INCREASES AND DECREASES

A decrease of $483,000 would be taken through reductions in each of ERS's four major program divisions.

Need for change. Marginal reduction in resources committed to economic research in areas where remaining resources and economic information can support continued analysis of critical issues permits reallocation of resources to other Department of Agriculture programs.

Nature of change. Reductions would be made in the indepth research and information undergirding analysis in the following designated areas:

- Reducing information and analysis on fruits, vegetables, and sugar, including work on fruit and vegetable marketing orders.
- Reducing work on aspects of soil conservation programs and water problems.
- Reducing analysis of linkages between agricultural and rural economic conditions including analysis of rural nonfarm financial problems.
- Eliminating staff analysis and international economic information on smaller trading countries and commodities of limited importance to U.S. exports and import trade.

Capacity to provide essential economic analysis of critical issues in these areas would be retained, but capacity for response to new or secondary issues would be reduced.

ECONOMIC RESEARCH SERVICE

Permanent Positions by Grade and Staff-Year Summary

1985 and Estimated 1986 and 1987

Grade	FY 1985			FY 1986			FY 1987		
	Headquarters	Field	Total	Headquarters	Field	Total	Headquarters	Field	Total
ES-4	6	--	6	6	--	6	7	--	7
ES-3	--	--	--	1	--	1	1	--	1
ES-2	1	--	1	1	--	1	--	--	--
ES-1	1	--	1	--	--	--	--	--	--
GS/GM-15	52	--	52	52	--	52	52	--	52
GS/GM-14	100	11	111	106	5	111	109	2	111
GS/GM-13	165	21	186	179	7	186	182	4	186
GS-12	154	7	161	158	3	161	159	2	161
GS-11	55	2	57	56	1	57	56	1	57
GS-9	56	--	56	56	--	56	56	--	56
GS-8	14	--	14	14	--	14	14	--	14
GS-7	55	--	55	55	--	55	55	--	55
GS-6	61	--	61	61	--	61	61	--	61
GS-5	55	2	57	56	1	57	56	1	57
GS-4	33	1	34	33	1	34	34	--	34
GS-3	10	--	10	10	--	10	10	--	10
GS-2	4	--	4	4	--	4	4	--	4
Ungraded Positions	2	--	2	2	--	2	2	--	2
Total Permanent Positions	824	44	868	850	18	868	858	10	868
Staff-Years:									
Ceiling	788	78	866	877	25	902	862	10	872
Non-Ceiling	--	--	--	--	--	--	--	--	--
TOTAL	788	78	866	877	25	902	862	10	872

Economic Research Service
GEOGRAPHIC BREAKDOWN OF OBLIGATIONS AND STAFF-YEARS
1985 and Estimated 1986 and 1987

	1985		1986		1987	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Alabama	$ 8,202	--	$ 3,000	--	$ 3,000	--
Arizona	103,856	2	34,000	1	9,000	--
Arkansas	314,857	7	90,000	2	--	--
California	371,496	7	329,000	4	57,000	1
Colorado	382,237	6	150,000	2	143,000	2
Delaware	30,403	1	--	--	--	--
District of Columbia	41,220,045	748	43,918,000	844	44,616,000	840
Florida	7,500	--	87,000	1	87,000	1
Georgia	158,361	3	42,000	--	--	--
Idaho	4,232	--	--	--	--	--
Illinois	166,810	3	87,000	1	--	--
Indiana	104,933	2	91,000	1	91,000	1
Iowa	52,960	1	102,000	1	--	--
Kansas	823	--	--	--	--	--
Kentucky	85,612	--	--	--	--	--
Maine	7,500	--	--	--	--	--
Maryland	80,239	--	57,000	--	57,000	--
Michigan	312,305	4	11,000	--	11,000	--
Minnesota	157,044	2	176,000	2	17,000	--
Mississippi	100,569	2	79,000	2	79,000	2
Missouri	117,523	2	56,000	1	2,000	--
Montana	65,208	1	--	--	--	--
Nebraska	283,035	6	16,000	--	16,000	--
Nevada	2,360	--	--	--	--	--
New York	67,373	1	10,000	--	10,000	--
North Carolina	213,708	2	60,000	1	60,000	1
North Dakota	30,000	--	--	--	--	--
Ohio	12,589	--	30,000	--	30,000	--
Oklahoma	159,199	3	37,000	--	25,000	--
Oregon	219,287	4	--	--	--	--
Pennsylvania	244,356	6	--	--	--	--
Texas	274,112	5	363,000	4	90,000	1
Utah	52,073	1	--	--	--	--
Virginia	4,323	--	22,000	--	22,000	--
West Virginia	74,684	1	--	--	--	--
Washington	--	--	9,000	--	9,000	--
Wisconsin	617,423	6	99,000	2	41,000	1
Total, Available or Estimate	46,107,237	826	45,958,000	869	45,475,000	850

ECONOMIC RESEARCH SERVICE

STATUS OF PROGRAM

The Economic Research Service (ERS) performs work under one appropriation item--economic analysis and research. A small portion of the work is carried out through cooperative and research agreements. All economic analysis and most economic research are carried out in Washington, DC. ERS-produced information is made widely available to farmers, farm organizations, farm suppliers, marketers, processors, and consumers, as well as to legislators, program managers, and other public officials at the Federal, State, and local levels. ERS information is released through research monographs, outlook and situation reports, staff reports, professional and trade journals, magazines, radio, television, newspapers, direct computer access, and frequent participation of ERS staff at various public forums. Current activities and selected examples of recent progress are outlined below:

ECONOMIC ANALYSIS AND RESEARCH

Current Activities: ERS monitors economic activity, makes short-term forecasts of key economic indicators, and develops long-range projections of U.S. and world agricultural production, demand for production resources (land, water, and manufactured inputs), and demand for agricultural commodities and food products. ERS measures returns to producers and evaluates the performance of the U.S. agricultural and food system. ERS also develops economic and other social science information on the organization and institutions of the U.S. and world agricultural and food systems, use and conservation of natural resources, and conditions affecting rural residents. In addition, ERS estimates the effects of public and private actions on farmers, rural residents and communities, the natural resource base, and U.S. society in general. Specific programs to which efforts are now being directed include:

1. Agriculture and rural economics.

   This program of research and analysis is designed to improve public understanding of national and regional rural and agricultural trends and conditions. That information contributes to more informed decisions on agricultural and rural issues by USDA officials, other decisionmakers in the executive and legislative branches of government, State and local officials, and the general public. The substantive content of the program of work is shaped by important trends and changes in the economic and sociodemographic structure of rural and agricultural America. Those trends and changes include: (a) financial problems in the farm sector, (b) import competition affecting rural manufacturing and agriculture, (c) changes in the Nation's macroeconomy, including the growing Federal budget deficit, deregulation (especially of financial institutions), and proposed changes in Federal income taxation, (d) delayed rural recovery from the 1979-82 recession, (e) reduced rates of rural population growth and retention (compared with the 1970's) and the resultant changes in the age composition of the rural population, (f) persistent rural poverty, (g) changes in the industrial composition of the rural economy, including the continued rapid growth of the service sector, and (h) Federal withdrawal from the grant-in-aid programs of the 1960's and 1970's.

This program is comprised of six broad areas of work--aggregate analysis and macroeconomics, agriculture and rural history, farm and rural economics, finance and taxation, human resources, and rural business and government. Ongoing work includes monitoring and analyzing trends in agricultural labor and farm and rural population through surveys conducted cooperatively with the Bureau of the Census. Also included is staff analysis in credit and finance (including structural implications for agriculture and rural economics), immigration reform as it affects the supply of agricultural labor, tax reform, and agricultural credit policy. An integrated program of research, staff analysis, and situation monitoring focused on the farm and rural economy will combine work on farm structure, agricultural labor, farm households and their income, and agriculture's role in the rural economy. An integrated program of credit research will combine work on agricultural finance with a more general program of work on rural financial markets. Another research program will examine the structure and organization and geographic differentiation of rural labor markets, focusing on the relative importance of human capital and social organizational factors in the determination of opportunities for rural workers. Experience of both agricultural and nonagricultural workers in rural labor markets will be included. A program of macroeconomic research and analysis with particular attention to the consequences of macroeconomic developments and policies for the agricultural sector and the rural economy will continue. Descriptive studies of rural public facilities using data from the National Rural Facilities and Services Survey and of rural public finance using data from the Census of Governments will be completed in 1986. A conceptual analysis of rural public service production and efficiencies in service outputs will be initiated.

2. International economics.

The international economics program is nationally and internationally recognized as a primary source of staff expertise, data, models, and research information about the agricultural economies and policies of foreign countries and the agricultural trade and development relationships between those countries and the United States. The primary focus of the program is trade and trade policy. Most of the resources of the program are directly or indirectly allocated to efforts designed to relate economic, technical, and political factors to agricultural trade among countries, including weather and technical production systems: commodity and financial market structure efficiency and performance; and governments' production, consumption, monetary, and trade policies.

The international economics program has three major components in its 1986 plan of work: research designed to provide understanding and quantification of the economic and political relationships determining agricultural production, consumption, prices, and trade in and among the countries of the world; a program to monitor current conditions in world agriculture, analyze the effects of changes in world conditions on U.S. agriculture, and forecast prospective world agricultural conditions and agricultural trade in the short and medium term; and maintenance of data bases and a capacity for rapid and effective analytical response to immediate concerns of the executive and legislative policymaking apparatus of the Federal Government with respect to global agriculture and U.S. agricultural trade and development. The ultimate objective of the research and outlook is to develop current, comprehensive,

and analytically-based knowledge of the structure and performance of world agriculture, to project agricultural and economic conditions, and to relate changing conditions in the rest of the world to the well-being of the U.S. food and fiber system. The program recognizes the interdependency of the world's agricultural economies as linked by commodity and financial markets. The global agricultural economy is far too large and complex to be effectively analyzed as a single system. Thus, many of the individual activities in this program of work focus on discrete subsets of countries, commodities, and policies. The results of those individual analyses are integrated and institutionalized in the analytical models and procedures and published by the staff.

During 1986, the efforts to identify and quantify relationships among macroeconomic conditions, policies, and U.S. agricultural trade with the rest of the world will be continued. Two major research thrusts will be initiated in 1986: a study of factors affecting short- and long-term competitiveness of the United States in world agricultural markets; and an analysis of the probable foreign and domestic effects of liberalizing world agricultural markets. The emphasis on competitiveness will be a continuing one while the trade liberalization study is designed to be completed during 1986 in order to provide analytical background and capacity to support the next round of multinational trade negotiations. Food aid needs analyses and forecasts will continue under a jointly funded project with the Agency for International Development. This research program will also continue to analyze the effects of institutional and political factors on agriculture and agricultural trade.

3. National economics.

The national economics program comprises current market intelligence, policy analysis in support of public decisionmaking, and economic research on the U.S. food and fiber system. While the activities under this program have a domestic focus, they incorporate both an international perspective and an explicit recognition of the resource base and the role of technological change in producing, processing, and distributing food and fiber products.

The national economics program is organized into three commodity areas (animal products, crops, and fruits, vegetables, and sweeteners), an area focusing on the post-farmgate food and fiber system, an area devoted to policy institutions affecting the production and consumption of food and fiber products, and an area with major responsibility for the development of economic indicators and the assessment of financial conditions within the farm sector.

There are several major thrusts to the national economics program. Among the principal continuing activities are situation and outlook responsibilities for crops, livestock, fruits, vegetables, sweeteners, farm costs, farm returns, food consumption, and food prices. Also, there is a continuing commitment to providing staff analyses on policy issues of importance to the public decisionmaking process. Research thrusts are directed to supporting those continuing activities as well as to building a stronger understanding of the economic behavior that characterizes the U.S. food and fiber system.

Of particular significance during 1986 are research efforts addressing issues related to the U.S. food and fiber system in an international market context; the nature of risk in agriculture and the implications of public and private strategies for dealing with risk; the adoption of emerging technologies in crop and livestock production, including the assessment of possible effects on the structure, location, and competitive position of selected subsectors; the economic effects of generic advertising for food and fiber products; the social costs and benefits of public policies for agriculture and the food system; assessments of the structure and performance of selected subsectors within production agriculture and components of the food processing and distribution system; and the development of more insightful economic indicators that describe the farm sector.

4. Natural resource economics.

The natural resource economics program comprises research, analysis, and situation and outlook reporting on agricultural resources and inputs. The primary emphasis is on soil, water, land, manufactured inputs, and technology issues of regional and national importance. The research encompasses: supply, demand, and price (value) analyses for agricultural resources and inputs; evaluation of agricultural resource conservation and environmental programs with implications for the agricultural sector; assessment of agriculture's effects on resource use and natural environments; and measurement of resource and input productivity, substitution possibilities, and response to technological change.

The goal of the program is to develop an integrated treatment of the factors entering the agricultural production process so that the tradeoffs between alternative policy initiatives can be evaluated, the consistency of Government programs can be clarified, and the interregional and intertemporal implications for agricultural resources can be assessed.

Areas receiving special emphasis in 1986 are: (1) evaluation of the costs and benefits of public intervention and investment in agriculture to maintain productivity, control environmental effects, and enhance technological progress: (2) monitoring and assessment of new technologies and their implications for resource use, the agricultural sector, and the environment; (3) analysis of agricultural resource and input supply, demand, and price due to changes in agricultural, macroeconomic, and international policies; (4) development of an integrated agricultural resources information base; and (5) enhancement of projections capabilities to identify potential productive capacity, resource constraints, technological change implications, shifting input mixes, and related resource adjustments over time.

Selected Examples of Recent Progress: Recent accomplishments under this appropriation item are cited below by program:

Agriculture and rural economics:

1. Farm financial conditions.

ERS researchers monitored the financial conditions of farmers and farm lenders throughout 1985. The overall financial condition of farmers deteriorated slightly from January 1984 to January 1985. The percentage of farms that are most likely to be experiencing financial stress (as measured by high ratios of farm debt to owned farm assets) increased from 18 percent in 1984 to 19 percent as of January 1, 1985. Since then more farmers have had difficulty in meeting their interest and debt repayment obligations as commodity prices have been further reduced by the large crops harvested in 1985. Of the farms with the most serious financial problems--both high debt/asset ratios and inability to cover all of cash expenses, interest costs, principal repayments, and minimal family living needs--over 38,000 were technically insolvent, 55,000 had debt/asset ratios between 70 and 100 percent, and 121,000 farms had debt/asset ratios of 40 to 70 percent. The tenuous financial condition of many farm lenders is underscored by the findings of ERS analysts that over 45 percent of farm operators' debt--over $55 billion--was owed by the farms that had both high debt/asset ratios and insufficient net cash income to fully service their debts. Of those farm loans that were not fully serviceable in 1985, over 32 percent were owed to the Farm Credit System, almost 18 percent to the Farmers Home Administration, almost 26 percent to commercial banks, and the remainder to individuals and other lenders. The number of agricultural bank failures as reported by the Federal Deposit Insurance Corporation were 7 in 1983, 25 in 1984, and 49 in the first 10 months of 1985. Nonetheless, a study of the incidence and consequences of rural bank failures found that few rural counties experienced loss of banking services because of a bank failure. In most cases, the failed institution reopened under new ownership and continued providing banking services to the community.

2. Financial deregulation and rural credit availability.

Research was undertaken to determine the likely effects of financial deregulation on the banking industry serving nonmetropolitan America. Preliminary evidence suggests that rural banks should not be particularly adversely affected by financial deregulation. ERS economists found that banks of similar size operate in a similar manner, whether located in urban or rural settings. Furthermore, rural banks have adapted to changing financial trends as well as urban banks have and are equally competitive. Nonetheless, differences in the regulatory environments, local economic conditions, and industrial mixes of the service areas of rural and urban banks suggest that the problems each group will likely face over the next few years are quite different. In particular, the heavy concentration in agricultural loans exhibited by many rural banks makes them susceptible to a continuing deterioration of farm financial conditions. That problem has already resulted in a disproportionately high failure rate among agricultural banks.

3. Economic conditions in farm-dependent areas.

Continuing their long-term analysis of socioeconomic diversity in rural America, ERS economists found that economic futures of most rural communities are more tied to overall national growth than to any one sector's success or failure. But that is less the case for farm-dependent rural areas and people whose economic welfare is directly tied to agriculture. Economic recovery in the farm-dependent areas has been stymied by the depressed farm sector and the slow recovery of the U.S. economy from the 1979-82 recession. For instance, in the 1979-82 downturn, employment in rural counties of the Corn Belt declined by 6.3 percent, compared to a decline of only 1.8 percent for all rural counties. In the 1980's, the food and fiber system, broadly defined, will still account for nearly one-third of the jobs held in rural America. Farming continues to be the dominant source of income in 700 of the 2,500 rural counties. The farming-dependent counties are concentrated largely in the Plains States and Western Corn Belt; smaller clusters are found in the Delta States and in southern Georgia.

4. Population and economic growth in the 1980's.

ERS demographers found that the nonmetropolitan population growth rate has declined to a level once again below that in metropolitan areas, probably because the nonmetropolitan economy was more seriously affected than the metropolitan economy by the severe economic slump that hit the country as the 1970's ended. Nonmetropolitan employment in the timber industries dropped as housing construction declined. Many rural industries were directly or indirectly hurt by foreign competition. In addition, the farm economy experienced severe economic stress in the early 1980's. Although part of the growth in metropolitan areas can be attributed to foreign immigration, the flow of migrants between metropolitan and nonmetropolitan areas has also been a factor. The reduced rate of nonmetropolitan growth has been widespread, but by no means universal. An increasing number of Farm Belt counties are experiencing population decline. On the other hand, most of the nonmetropolitan counties that have retirement or recreation areas continue to show steady growth, as do the majority of nonmetropolitan counties in the South and West.

5. Capital structure and investment in agriculture.

ERS economists have examined factors influencing the level and timing of agricultural investment. One study suggests that a significant share of investment in agricultural assets can be attributed to Federal income tax policy. Tax policies between 1956 and 1978 stimulated net investment in agricultural structures by more than $1 billion (1972 dollars). The investment tax credit was the most effective tool in stimulating agricultural investment. In another study, ERS researchers examined the effects of interest rates on investment in agricultural machinery. Changes in interest rates had only a minor direct effect on such investment, but they did affect investment indirectly by altering the rate of adjustment of agricultural machinery to optimal levels. Higher real interest rates delay investment because discounted future profits are lower; lower real interest rates hasten investment. For example, adjustment rates increased significantly between 1971 and 1974 because of a sharp decline in the real interest rate. The large increase in investment over that period has been attributed to the large increase in agricultural income. However, results from the ERS analysis suggest an alternative explanation--the growth of investment can be attributed to an increase in the cost of foregone profits.

6. Tax reform and the agricultural sector.

ERS economists provided Federal policymakers with an assessment of the effects of the Administration's tax reform proposal on the agricultural sector. Their analysis indicated that 3 out of 4 farmers would be in the new 15 percent tax bracket and that most farmers would pay about the same or less in Federal income taxes. However, some farmers, particularly livestock producers, would pay more in taxes under the Administration's tax reform proposal. The elimination of the investment tax credit and the replacement of the Accelerated Cost Recovery System with an indexed depreciation system based on economic depreciation patterns would cause a small increase in the cost of capital. That would lead to a slight decline in overall investment. However, the sector would benefit from the more efficient allocation of capital resulting from the more neutral treatment of the various types of farm and nonfarm capital. For most farmers, the effects of tax reform on aggregate agricultural investment, production decisions, and the economy as a whole is expected to be of greater importance than the effects on individual tax burdens. While the effects on the overall economy would be small, the sector would benefit from increased personal consumption expenditures, particularly on food. Reduced incentives and opportunities for tax-motivated investments would reduce distortions in relative input and commodity prices that have occurred as a result of the current tax system.

7. Poverty in rural areas.

Despite significant economic and social gains made through government programs to assist the poor, high poverty levels persist for rural people. Of 35 million Americans who were poor in 1983, 38 percent lived in nonmetropolitan areas. That represents 18 percent of the nonmetropolitan population, the highest rate since the 1960's. In addition, ERS research found that poverty has become a chronic problem in nearly 250 nonmetropolitan counties where low incomes have persisted over several decades. The economic slump of the early 1980's was a primary factor that raised poverty levels in both nonmetropolitan and metropolitan areas, and the nonmetropolitan economy was more seriously affected than the metropolitan economy. In nonmetropolitan areas, median family income steadily decreased from a high of $23,345 (1983 dollars) in 1978 to $20,747 in 1982, and the unemployment rate hit a 1983 high of 12 percent. Although the performance of the general economy influences aggregate poverty levels in both metropolitan and nonmetropolitan areas, the effects have not been reflected evenly across all groups. During the economic recession of the 1980's, for example, poverty rates continued to drop for the rural elderly because of the positive influence of the Supplemental Security Income program and the inflation indexing of Social Security income. In contrast, poverty among nonmetropolitan children has undergone a dramatic rise, stemming in part from an increase in female-headed families. Over half (50.7 percent) of the nonmetropolitan poor in 1983 were under 18 years old.

8. History of rural and agricultural policies.

Farm Bill discussions and the continuing economic stress experienced by some farmers led ERS historians to study the history of rural and agricultural policies. History does not necessarily repeat itself, but there is a growing awareness that the current situation can best be understood if we know its background. Research on the background of current agricultural policies showed that few, if any, entirely new proposals were being made. Basically, the current price support system has been in effect for over half a century, even though the Secretary of Agriculture called it a temporary measure when it was enacted. Since that time, various modifications have been made. For example, the laws through 1949 called for rather rigid acreage controls in exchange for price supports. Those controls have eroded over the years and have not been part of recent omnibus farm bills. Beginning in 1973, the Government made stronger commitments of what were essentially income support payments than in the first 40 years of the programs. Research on the authority and programs for rural development reveals that the programs undertaken have never fully met the goals of the authorizing legislation. In part, the problem has been that Congress has often not funded some of the authorized programs, and in part that the programs have been carried out by several different agencies of the Department reporting to different assistant or under secretaries.

International economics

1. Demand for U.S. agricultural exports.

ERS analysts found that in the first year after a change in world prices, the volume of exports could be expected to change less in percentage terms than the opposite change in world prices, thus resulting in a loss of export earnings if U.S. export prices declined. A world price change would not greatly affect export revenue in the second year. In the third and later years, U.S. crop export revenues could be considerably changed in the opposite direction of a world price change. In addition, ERS commodity analysts estimated the excess supply and excess demand responses for all the regions of the world aggregated with appropriate export quantity weights across regions to obtain estimates of the shortrun and longrun responsiveness of demand for U.S. exports. The results suggest similar price/volume relationships as provided by global model results except for a slightly longer response time before demand becomes elastic.

2. Agricultural and trade policies.

EPS economists evaluated the more significant policies employed by the United States and other major trading countries that affect U.S. exports. Commodity price and income policies, trade policies (such as embargoes, subsidies, credit, and food aid) and the effects of exchange rates and debt repayment options were included. The costs of domestic and trade policy interventions, as measured by government expenditures on agriculture were compared for the United States and other countries. Japan ($15.8 billion) and the United States ($8.5 billion) are ranked at the top of the list. Price and income supports comprise the largest amount of assistance for both countries. Much of the support for agriculture, however, is through other means. The European Community (EC) and Japan can raise prices to producers simply by restricting imports. The direct budgetary costs of those interventions may be negligible but the subsidy very large. ERS researchers found, however, that apart from the EC, U.S. competitors are providing relatively little assistance to their producers in the form of direct producer subsidies.

A cooperative research effort with the University of Maryland yielded an analytical framework for measuring the gains from free trade of U.S. farm products. Estimates of gains from free trade (a movement to free-market equilibrium trade patterns) were made for wheat, corn, cotton, and rice. Free trade would increase the gains from trade by approximately 5 percent for wheat and 15 percent for cotton and rice, if U.S. commodity programs were altered along free market lines. Also, the analysis shows that there is a tradeoff between the welfare of participating and nonparticipating producers under current programs. When land retirement is not required, income is transferred from nonparticipating to participating producers.

3. Competitiveness of U.S. agriculture.

International competitiveness in complex world markets is difficult to assess. In 1985, ERS initiated a multiyear study on the competitiveness of U.S. agriculture vis-a-vis agriculture in other countries. ERS economists outlined the issues and problems concerning U.S. competitiveness in world markets. A clear distinction between the concept of "comparative advantage" and "competitiveness" was established. Production and consumption relationships, along with policy interventions, are key factors in identifying those concepts. Exporting countries' trade and agricultural policies were identified. A large data base documenting those policies was developed to assess the trade barriers and export subsidies by U.S. competitors.

4. World economic conditions.

EPS analysts found that monetization of the Federal deficit may have temporarily helped agriculture in the short term during the mid-1970's but had an adverse effect over a longer period. More specific efforts to improve the quantification of those macroeconomic linkages to agriculture and agricultural trade include a study that suggests a better way to construct measures of exchange rates that can be used to generate leading indicators for agricultural trade. Pilot studies are also being done to calculate the effects of specific macroeconomic policy changes on U.S. agricultural trade. One such study completed for Mexico shows that a rescheduling of Mexican debt would increase U.S. agricultural exports to Mexico.

An extensive effort is also being made to link existing commercial macroeconomic forecasts and models to forecasts of U.S. agricultural trade and farm income. Exercises with those analytical tools have clearly demonstrated that increased protectionism in world markets would be very damaging to the future prospects for U.S. agricultural exports, while steady and robust world economic growth and a weaker dollar could lead to a restoration of export growth for U.S. agriculture.

5. African food crisis.

The African food crisis covers a large number of countries that cannot hope to feed their people until economic development of the agricultural sectors (and in most cases of their total economies) occurs. Usually those countries do not have resources in the form of foreign exchange to commercially purchase food to fulfill their needs. Responding to requests for information and periodic briefings required constant monitoring of weather, production, and financial conditions in those countries, as well as regular analysis of their food aid requirements. Estimates of food needs for 1984/85 were 11.4 million tons of grain.

Until that recent food crisis, there were several "official" estimates of food aid needs within the U.S. Government and international organizations. An Interagency Food Aid Analysis Working Group was established to better facilitate more timely and adequate U.S. Government response to food crises. ERS was made the lead agency. That interagency cooperation brought about a decision to change the ERS's Food Needs and Availabilities Report from an annual publication used primarily for budgetary purposes to a jointly (ERS/AID) produced quarterly report used as a programming instrument by AID.

6. Global modeling.

Research in the international economics area has been improved by enhanced modeling capability. ERS analysts developed and documented a procedure for running country grain, oilseed, and livestock (GOL) models on microcomputers. That makes analysis of worldwide and single-country problems possible for ERS analysts and the general public, and is helping ERS reach its goal of making practical model-based research results more readily available to policymakers and the general public.

National economics:

1. Agriculture in an open economy.

ERS researchers found that the linkages between the farm economy and the national economy are so close that conditions beyond the farm gate can affect agriculture as much as farm programs. Business cycles are no longer confined to national economies; they are international. Since farm exports depend so heavily on economic conditions abroad, global business cycles have a major effect on the demand for U.S. farm products. The net result of those developments is that national and international economic forces influence farmers' production costs, the demand for their products, their competitiveness in domestic and international markets and, ultimately, their income levels and wealth. The importance of agricultural trade to the economy as a whole is illustrated by other information compiled by ERS. Each dollar earned from agricultural exports stimulates another $1.37 of output in the U.S. economy; approximately 80 percent of that additional economic activity accrues to the nonfarm sector; over 1 million jobs are related to U.S. agricultural exports.

ERS research revealed that U.S. agriculture has the capacity to meet expected growth in export demand. Limits to natural resources, energy, labor, and purchased farm inputs are not likely to restrict growth and induce food shortages. U.S. agricultural policies adopted during the late 1980's and beyond will affect how U.S. agriculture continues to operate. If export markets recover from the slowed growth of the early 1980's and advance at average rates close to the longrun trend, agriculture will continue to grow. However, if they do not, there are two options: either rely again on sizable income transfers to avoid another depression in the agricultural economy about the size of the present one; or scale down the agricultural sector so that it, once again, produces primarily for the domestic market. While the latter option could result in a prosperous but much smaller agricultural sector than at present, it would also raise serious questions about where the world's food supplies would come from because the United States is now a major exporter.

2. Structure and performance: U.S. farm production sector.

ERS analysts found an improvement in physical performance of the U.S. beef cow-calf sector since the mid-1970's. The average number of calves born annually per 100 beef cows and breeding-age heifers increased from 79 in 1975 to 87 in 1980. Average weight per head of feeder cattle sold or placed on feed by cow-calf producers increased by amounts ranging from 11 pounds per head for heifer calves to 32 pounds for yearling steers. The total weight sold was 7.6 percent greater in 1980, reflecting improvements in both growth rates and death loss rates. However, returns to operator management and risk have been increasingly negative each year since 1979.

Regional production shifts in the dairy industry were documented by ERS analysts. Milk production increased more during the last decade in many western, southwestern, and eastern States than in the more traditional dairy States. Investment in large-scale dairies in the Southwest is more profitable than in smaller dairies in the northern climates. The lower rate of return to total investment in Minnesota (0.46 percent for a 52-cow dairy and 4.74 percent for a 125-cow dairy) compared with New Mexico (15.21 percent for a 900-cow dairy) and Arizona (8.51 percent for a 359-cow dairy and 11.12 percent for an 834-cow dairy) reflected lower milk prices, less milk produced per cow, and higher investment requirements.

Another ERS study revealed that a 1-percent change in the farm price increases national milk production about half of 1 percent over 4 years. The greatest effect occurs in the first and second years after the price change, with only a small effect the year of the change. Smaller production effects occur in response to changes in the remaining factors. A 1-percent rise in feed costs, for example, decreases milk production by an estimated 0.16 percent over a 4-year period. Feed and beef prices provide an indication of the gains from switching to alternative farm enterprises. A 1-percent increase in the beef price reduces national milk production by 0.06 percent over 4 years.

3. Structure and performance: The U.S. marketing sector.

An ERS study revealed that the number of meatpacking plants in the United States declined while the size and proportion of business accounted for by large firms has increased over the past decade. In 1972, there were 6,156 commercial livestock slaughter plants in the United States; the number peaked in 1976 at 6,255 and dropped to 5,558 at the end of 1983. The plants are increasing in size along with firms. The number of plants with an annual slaughter of more than 500,000 steers and heifers increased from 3 to 12 between 1972 and 1982 and accounted for 36 percent of the slaughter in 1982. Hog plants slaughtering more than 1 million head per year increased from 23 to 35 during the decade and accounted for 59 percent of hog slaughter in 1982.

The turkey industry stands as a major example of an industry that has benefited from rapid change, according to an ERS study. The industry skyrocketed from a modest enterprise with a gross farm value of $270 million in 1950 to a thriving, complex agribusiness with a gross farm value of $1.26 billion in 1983. Industry innovation in marketing turkey through further processed products, such as turkey rolls, roasts, pot pies, and frozen dinners, made further processing the fastest growing

segment of the industry. Turkey producers are also increasingly vertically integrated, performing all functions from farm to retail. Turkey is now cut up, packaged, and transported to retail by producers. Vertical integration has reduced costs of producing poultry products by improving the use of facilities, reducing and controlling financial risks, and assuring continuing supplies of the necessary inputs into each stage of marketing, as well as by providing steady outlets for the products.

An ERS study of vertical integration in general reveals that 23 percent of all food industry shipments (across all channels) are directed to establishments owned by the seller. The food industry ranks below such industries as transportation equipment, petroleum refining, and textiles in that respect. The food industry's share rises to 27 percent when only manufacturing establishments are considered.

4. Food and agricultural policies and programs.

ERS policy analysts worked on the Administration's proposed farm bill, which represented a radical departure from existing law--a market-oriented bill that would eventually reduce the Government's role in price and income supports, stockholding, and production control programs. In addition to the Administration's proposal, ERS commodity analysts analyzed over two dozen farm bills proposed by Congress and farm groups.

ERS policy analysts also provided analysis and close support to Congressional staff on the Downey-Gradison amendment to lower sugar price supports beginning in the 1986 crop year. An evaluation was made of a major initiative to allow quota-exempt sugar to compete with domestic corn with potential benefits for U.S. sugar refiners, consumers, and world sugar exporters. Continuation of the current U.S. sugar program was analyzed in terms of the effects on developing countries. The results indicate that developing country imports would fall over 20 percent in 1985 and that developing country export revenues would decline more than $200 million in 1986 without a program change.

A Congressionally-mandated study by ERS provides an example of an alternative dairy price support mechanism that would have performed better than parity during the past decade. The mechanism consists of three major parts: an index of weighted prices of milk production inputs and the consumer price index, a longrun adjustor of the 10-year moving average of real prices, and a shortrun adjustor that slides a discretionary range based on the level of recent surplus. That study found that use of that alternative mechanism probably would not have eliminated either the price volatility of 1973-75 or the surplus of the early 1980's. But the magnitude of both could have been greatly reduced. The mechanism would have required significantly higher support prices during the price trough between mid-1974 and mid-1975, which likely would have curbed the sharp market price response of late 1975. The mechanism would have raised support prices much less at the start of the 1979/80 and 1980/81 marketing years. Since October 1981, the minimum support level would have been virtually frozen at a level well below actual support levels. Both a quicker response to the developing surplus and lower support prices may well have held down surpluses during the early 1980's.

In another mandated study, ERS researchers concluded that, among selected States, release of farmer-owned reserve stocks appeared to materially lower the State's monthly grain prices relative to the U.S. average. That situation was limited to corn in Nebraska and Kansas and wheat in Oklahoma and Washington. The researchers also concluded that adjusting the 5-day moving average prices based on production-weighted and reserve-weighted daily prices as alternatives did not differ greatly from the simple average mechanism currently used by the Agricultural Stabilization and Conservation Service to determine release status.

A combined peak and off-peak rail rate policy would result in a more efficient use of U.S. railroads while transporting feed grains, according to another ERS study. The study, using a linear programming, time-staged, modified transshipment model, determines what might have happened if flexible rail rates had been in effect during a representative crop year. Regardless of the rate response scenario examined, a change in railroad rates of 5 to 15 percent increased rail revenue and volume, reduced the seasonality of rail demand, and created incentives to store at country locations and ship at a later date. However, the overall financial stability of the feed grain market was adversely affected; and total costs of storage, transportation, and handling generally increased. Since total costs increased, prices received by farmers would tend to decline. Regional effects varied as prices received by farmers rose in some feed grain deficit production regions but declined in some surplus regions.

5. Economic indicators of the farm sector.

ERS compiled basic data on the financial condition of the farm sector that showed that the number of farms experiencing financial stress continued to be abnormally large into 1985, especially for dairy, cash grain, and livestock producers in the Northern Plains, Lake States, and Corn Belt. ERS's Farm Costs and Returns Survey, conducted in the spring of 1985, indicated that almost 320,000 farms (18 percent of the survey's estimated number of farms) closed out the year with a debt load exceeding 40 percent of the value of their assets. Approximately 214,000 of those farms were estimated to be unable to cover production expenses, family living needs, and debt principal repayments out of current farm and nonfarm income. The survey data also showed that total income of the average farm operator's household from farm and off-farm sources was $26,633 in 1984. Most types of farms experienced some deterioration in their financial position between 1979 and 1982.

ERS compiled basic data on costs of production that showed that average cash costs of producing major U.S. crops increased about 5.7 percent per acre in 1984, mainly because of higher prices for seed, fertilizer, and machinery. Yields recovered from 1983's drought, but prices fell 8 percent, resulting in lower receipts for most crops. Livestock production costs fell an average 1 percent, while dairy costs were up 3.2 percent. Overall, livestock and milk returns increased by 151 percent, mainly because of net cash flow for fed cattle going from a minus $6.67 to a minus 93 cents.

Other reports in ERS's economic indicators of the farm sector series provided a variety of important information on the economic conditions of the farm sector. Income from all farm and nonfarm sources totaled $24,090 per farm in 1983, down from $25,731 in 1982. Farmers grossed 4 percent less than the year before on sales of farm goods. Crop receipts fell nearly 7 percent. Livestock earnings declined 1 percent. Farm

productivity declined across the Nation in 1983, ranging from a 3 percent drop in the Pacific region to a 26 percent decline in the drought-stricken Corn Belt.

6. Food consumption, prices, and expenditures.

ERS reported that in the past two decades major shifts occurred in per capita food consumption and expenditures. Compared to 1960-63, for example, the U.S. diet now contains a larger share of poultry, fish, and fats and oils, particularly vegetable oil. Dairy products, however, have not fared as well. Their share of total consumption dropped from 17.3 percent to 14.8 percent between 1960 and 1983.

ERS also reported that retail grocery food prices increased 3.8 percent in 1984, compared with a 2.1 percent rise in 1983. The larger rise reflected tighter supplies of some farm products, higher farm prices, and a bigger rise in the farm-to-retail price spread. Food price increases for both years were much weaker than in recent years, and the share of income going for food continued downward. Eating away from home took 40 cents of every food dollar in 1984, up from 27 cents in 1960. After adjusting for inflation, away-from-home expenditures increased 2.7 percent annually from 1954 to 1984, compared with 1.3 percent for food at home. As the food-away-from-home industry grows, so does the need for a reliable set of standards for measuring changes and capturing appropriate and useful data. ERS, after working with industry representatives for almost two decades, has developed definitions, data sources, methodologies, procedures for collecting information, and techniques for estimating food costs, sales, and outlets.

Natural resource economics:

1. Resource supply, utilization, and value.

In 1985, ERS economists closely monitored the effects of high interest rates and reduced credit availability on U.S. agricultural resource value and use. The annual ERS survey of agricultural land values found that farmland values declined 12 percent from April 1984 to April 1985. That drop was the largest since the early 1930's. The largest declines occurred in the Corn Belt, Lake States, and Northern Plains where farmland values dropped by 20 percent or more. Continued declines are expected during 1986, but their magnitude will depend on farmland earnings as affected by commodity support levels, credit availability (as influenced by developments in the macroeconomy), and prospective farm credit provisions in the 1985 Farm Bill.

Among purchased inputs, the most dramatic adjustments have occurred for farm machinery sales. With a continued weakening of farm economy, those sales are projected to continue to decline, dropping 9 to 12 percent in 1985 from the $7.28 billion level of a year earlier. Energy use in U.S. agriculture has actually increased over recent years. An ERS study of energy use for irrigation pumping found that land irrigated with on-farm pumped water increased 9.5 million acres, to 44.6 million, between 1974 and 1983. Aggregate energy use in agriculture has increased for all fuel sources except gasoline.

Ground water mining (a decline in ground water supplies) is widespread in Florida and ten major ground water irrigation States west of the Mississippi River. An ERS study indicates that approximately 45 percent of the 34 million acres of cropland irrigated from ground water sources are located in areas where water levels declined six inches or more annually. Between 1977 and 1983, ground water mining increased in each

of the 11 States, except Texas, that experienced a 30-percent decline in irrigation in areas with reduced ground water supplies. Lower water levels increase pumping costs and lead to the eventual economic depletion of ground water supplies. Farmers adjust to changing pumping costs and water availability by adopting more efficient irrigation and water conservation practices. However, total water use may change very little because the number of irrigated acres has increased. Nationally, the effect of ground water mining has been small because irrigation has increased most in areas where ground water levels are not falling. Since 1980, commodity price changes have had a larger impact on irrigated acreage than changes in pumping cost or water availability.

2. Program performance and consistency.

An interim economic evaluation of the Rural Clean Water Program found that severity of pollution is not a good indicator of the economic damages being caused by agricultural activities. Economic damages and potential benefits of reduced pollution depend heavily on the water uses, such as recreation, that are being impaired, and the number of people affected.

An ERS study of USDA erosion control programs revealed that economic benefits of protecting soil productivity and preventing offsite damages may be less than the public and private expenditures for erosion control on cropland. However, the benefit-cost ratio exceeds 1.0 for erosion control programs on cropland eroding at over 15 tons per acre per year. No appreciable differences were found in the benefit-cost ratios of the three major erosion control programs of USDA. Offsite benefits account for about two-thirds of total benefits from cropland erosion control, indicating significant benefits from soil conservation programs accrue to the public in addition to benefits to private landowners. Improvement in conservation program efficiency could be obtained by redirecting resources to land eroding at over 15 tons per acre and other locations where erosion contributes to large offsite economic damage.

A variety of behavioral and programmatic factors were identified as sources of potential improvement in the performance of soil conservation programs. Based on analysis of landownership data from USDA's Resource Economics Survey, ERS economists have challenged the conventional view that farmers are more concerned about erosion on land they own than on land they rent. In fact, conservation management practices used by farmers on rented land compare favorably with those on owned land.

Targeting USDA erosion control efforts increases the effectiveness of Federal investments in erosion control programs. Farmers increased their use of SCS technical assistance and ASCS cost-sharing in four States targeted by USDA in 1981-82. The rate of adoption of erosion control practices, especially conservation tillage, was accelerated in all four States. Reductions in soil loss followed. Long-term agricultural productivity increased in three of the four States. Use of variable cost-share rates, based on the amount of erosion reduction achieved, has good potential for increasing the effectiveness of public conservation expenditures.

A study of the effects of sodbusting found that the practice is not adding greatly to current soil losses but may lead to increased erosion in the future. Legislation has been proposed in Congress to curb sodbusting by denying farm program benefits to farmers who grow supported crops on highly erodible new cropland. The ERS study found that the legislation, as currently proposed, would apply to only a small share of new cropland. For sodbusting legislation to be effective, more precise identification of highly erodible land will be needed.

ERS analyzed various policies that have been proposed for the combined purposes of conserving soil and reducing surplus commodity production. Long-term acreage retirement and conservation-oriented commodity programs have potential for increasing soil conservation while reducing surplus crop production. Current commodity programs tend to discourage conservation. Retirement of land eroding at the highest rates would save the most soil but cost the government more than other retirement options. Retirement of surplus corn acres targeted to highly erodible land could be cost-effective for both conservation and commodity program objectives. Cross-compliance would not promise widespread conservation benefits and might reduce commodity program effectiveness, but compliance incentives and modest changes in commodity programs could complement other soil protection measures.

All versions of the 1985 Farm Bill have contained provisions for a Conservation Reserve Program for the conversion of cropland to grass or trees. The objective is to retire erodible lands for a period of 5 to 10 years. ERS analyzed a variety of options for implementing a conservation reserve program, focusing on their effects on both soil conservation and farm program costs. The estimated economic effects of conversion are very sensitive to expectations regarding crop yields and prices. However, conservation reserve programs seem likely to reduce total government costs by providing a less expensive way to retire cropland acreage.

3. Plant protection systems.

The need to balance agricultural production goals with environmental quality and human health objectives is the cornerstone of pesticide regulation assessment. An ERS study concluded that removing pesticides with alleged environmental and safety risks from the market could increase U.S. agricultural production costs, crop prices, farm incomes, and consumer expenditures for food. Effects will not be uniformly distributed. Farmers relying on the affected pesticides could be faced with using higher cost pest control alternatives. Banning all materials in a group of pesticides would have the most severe effects, while banning an individual pesticide would not significantly affect crop yields or production costs.

ERS evaluated the economic impacts of the Boll Weevil Eradication Program conducted on 40 thousand acres of cotton in North Carolina. Cotton insect control expenditures dropped from an average of $51 to $17 per acre. Overall, the Boll Weevil Eradication experiment increased profits for cotton growers. Cost-shared boll weevil eradication efforts now are proceeding in the Carolinas and Georgia.

POTENTIAL BANS OF CORN AND SOYBEAN PESTICIDES: ECONOMIC IMPLICATIONS FOR FARMERS AND CONSUMERS. By Craig Osteen and Fred Kuchler, Natural Resource Economics Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 546.

Abstract

Removing corn and soybean pesticides with alleged environmental and safety risks from the market could increase U.S. agricultural production costs, crop prices, farm incomes, and consumer expenditures, causing farmers to gain and consumers to lose. Banning all triazines, acetanilides, soil insecticides, or seed treatments would have the largest effects. This report uses an econometric-simulation model, incorporating relatively new developments in welfare economics, to analyze the economic implications of potential bans of corn and soybean insecticides, nematicides, fungicides, and herbicides through cost and yield assessments. Banning an individual corn or soybean pesticide would not significantly affect crop production, but banning all pesticides used for an important pest problem would have substantial effects. This study also demonstrates the interdependence among pesticide regulatory decisions.

Keywords: Pesticide regulations, benefit-risk assessment, economic implications, corn, soybeans, pesticide use

Note: The use of company trade names is for descriptive purposes only and does not imply endorsement by the U.S. Department of Agriculture.

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Contents

	Page
Summary	iv
Introduction	1
Pesticide Regulations and the Agricultural Economy	1
Previous Analyses	2
Analytic Methods and Information	3
The Pesticide Assessment of Field Corn and Soybeans	3
Analytical Model	4
Scenarios and Estimates	5
Insecticides and Nematicides	6
Insecticide and Nematicide Scenarios	7
Effects of the Insecticide and Nematicide Scenarios	9
Fungicides	10
Fungicide Scenarios	11
Effects of the Fungicide Scenarios	11
Herbicides	13
Herbicide Scenarios	14
Effects of the Herbicide Scenarios	18
Conclusion	19
Implications	21
References	23

Summary

Removing corn and soybean pesticides with alleged environmental and safety risks from the market could increase U.S. agricultural production costs, crop prices, farm incomes, and consumer expenditures, causing farmers to gain and consumers to lose. Banning all triazines, acetanilides, soil insecticides, or seed treatments would have the greatest effects. Farmers would gain in the aggregate from lowered yields because fewer crops would enter the market, causing prices, and thus incomes, to increase.

This report examines the economic implications of potential bans on corn and soybean insecticides, nematicides, fungicides, and herbicides from the marketplace. Economic implications include losses in yield potential, changes in U.S. production and production costs, input price increases, crop price increases, and changes in profits. TECHSIM, an econometric-simulation model incorporating relatively new developments in welfare economics, uses data representing technological or regulatory changes (per-acre cost and yield changes), estimates changes in economic welfare, and forecasts changes in per-acre and total profits for each of the 13 domestic production regions examined.

Of all the scenarios examined, banning triazines (atrazine, cyanazine, metribuzin, and simazine), acetanilides (alachlor and metolachlor), all soil insecticides (carbofuran, chlorpyrifos, disulfoton, ethoprop, fonofos, isofenfos, phorate, terbufos, and others), or all seed treatments (captan, carboxin, and thiram) would have the largest effects on U.S. crop production. Banning all foliar insecticides, thiocarbamates, or dinitroanilines would cause only minor effects. Except for atrazine and bentazon, banning the individual compounds (or a few insecticides) examined would have only minor effects. However, individual growers in some regions could suffer substantial losses.

Other findings in this report include:

- If any corn or soybean pesticides were removed from the market, production efficiency would decline from lower yields and higher production costs, causing higher prices. Therefore, producers would gain from higher prices but consumers would bear a substantial cost of the removal.
- In all scenarios, the prices of corn and soybeans would increase while production would decrease, regardless of whether one or both crops were directly affected by the potential ban. The returns to crops treated with regulated pesticides would almost always increase more than would the returns to other crops. However, farmers suffering increased crop losses due to the removal of a pesticide may suffer financial losses even though farmers as a whole would gain.
- Overall effects of the pesticide removal would be relatively small if individual compounds (except for atrazine or bentazon) were withdrawn but much greater if entire pesticide groups or all alternatives for a pest problem were withdrawn.
- Canceling a pesticide registration reduces the number of alternatives available for a particular pest problem and thus the number of alternatives available in the event of any future cancellation. Economy-wide impacts could occur if enough pesticides were removed from the market and if new alternatives were not introduced. This problem is compounded if a pesticide examined later is found to have greater health, safety, or environmental risks than a pesticide previously removed from the market.

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Potential Bans of Corn and Soybean Pesticides: Economic Implications for Farmers and Consumers

By Craig Osteen and Fred Kuchler

Introduction

Pesticides prevent losses in crop yields caused by insects, diseases, nematodes, and weeds. However, pesticide use may create environmental and safety risks. The U.S. Environmental Protection Agency (EPA) examines the risks of pesticides, weighs those risks against the benefits, and decides whether any pesticide should be removed from the market. Removing agricultural pesticides from the market may reduce the efficiency of crop production: yields may decrease due to pest infestations, or the costs of production may increase, which could increase costs per unit of output. If crop losses and/or cost increases are great enough and are suffered over a large area, repercussions would occur throughout the economy. Aggregate production would decrease and crop prices would increase, so consumers would bear a substantial portion of the costs of pesticide regulations.

This report estimates the aggregate economic effects of potential bans on corn and soybean pesticides, including changes in crop production, crop prices, farm incomes, and the sum of consumer welfare and intermediate profits. Analysis of regional effects or redistribution of income among different groups of farmers will be left to other reports. No attempt was made to compare risks and benefits or to consider potential long-term effects of regulations on pest resistance to pesticides, changes in pest composition, new pest control developments, or the viability of individual farms.

Expert estimates of yield losses and changes in production practices resulting from a variety of pesticide bans can be found in (*10-15*).[1] This report demonstrates the economic implications of some of those estimates and reveals an interdependence among regulatory decisions. Removal of a pesticide from the market reduces the number of alternatives available for future consideration. And although the effects of removing a pesticide from the market may be minor, removal may increase the economic effects of future decisions to remove other pesticides from the market. The current regulatory process does not account for this interdependence and could result in substantially harsher economic effects over time than would an approach which accounts for the interdependence. This report, and the pesticide assessments upon which it is based, suggests ways to account for this interdependence in the pesticide regulatory process.

Several corn and soybean pesticides are currently under EPA regulatory review and could have their registrations modified or canceled: captan, a seed treatment for corn and soybeans; alachlor and linuron, corn and soybean herbicides; cyanazine, another corn herbicide; and aldicarb, a soybean insecticide/nematicide. EPA wants data on many corn and soybean pesticides as part of reassessment and reregistration.

Pesticide Regulations and the Agricultural Economy

Removing pesticides from the market reduces options available to control some pests. Alternative controls, if any, may be less effective in reducing pest populations and preventing pest damage to crops. Yields may decrease and/or production costs may increase. Even if equally effective alternative controls were available, they may be more expensive. Also, farmers may try to maintain yields by using cultural practices, such as

Note: The results presented in this report are preliminary and should not be construed as an official U.S. Department of Agriculture response to EPA regulatory actions.

[1] Italicized numbers in parentheses cite sources listed in the References.

cultivation, which increase costs. Yield losses and cost increases will reduce production efficiency for farmers directly affected by pesticide bans.

If the pesticide(s) withdrawn from the market was popular and could be used to control more than one pest, the demand for alternative pesticides might increase enough to increase pesticide prices. Prices could remain high until production capacity or supplies of materials increase. If there were few alternative pest controls, banning one or more pesticides could give sellers market power and they, in turn, could maintain higher prices for alternative pesticides. However, pesticide price increases will not only affect costs for farmers who purchased the banned pesticide but also for all farmers who use alternative pesticides.

If substantial yield decreases or cost increases are suffered over a large area, the market will spread the effects on production efficiency unevenly throughout the economy, changing the prices and production of several crops. Higher costs or reduced profitability from lower yields will induce some farmers to grow other crops (requiring a different pesticide mix) or to abandon farming. The supply shift would lead to higher commodity prices, which in turn influence planting decisions, and lead to acreage changes for crops directly affected by the pesticide ban and for crops that farmers might plant instead. The responsiveness of planted acreage and production to crop price changes is an important factor in distributing the effects of regulations. The efficiency loss will hurt some farmers, while others will enjoy the resulting price increase. Removing pesticides from the market may increase costs and reduce production possibilities in many sectors. And consumers would bear some of these costs when paying higher prices for food.

Previous Analyses

Previous studies of potential pesticide regulations confronted a scarcity of information about pest losses and farm production cost changes, and the choice of analytical methods. These studies generally relied on expert assessments of yield and cost effects of potential actions. EPA and the U.S. Department of Agriculture (USDA) have conducted short-term assessments of pesticides under regulatory review. Estimates of yield losses and cost changes typically have been developed on a case-by-case basis. Assessment teams developed expert estimates for the pesticide in question.

Early studies analyzed the economic effects through partial budgeting techniques and price elasticities. These studies usually estimated changes in production, production costs, prices, and incomes for the crop directly affected by the regulation under review. These studies did not estimate the response of crops indirectly affected by the regulation or effects on purchasers of agricultural commodities. Attempts to increase the sophistication of the economic analyses of pesticide regulations by computing price and production changes with large-scale models showed interactions between the supply and demand of several crops and also estimated changes in such welfare indicators as producers' and consumers' surplus. Consumers' surplus is the difference between what consumers are willing to pay and what they have to pay to acquire commodities. Producers' surplus measures rents and profits.

EPA has made more recent assessments with TECHSIM, the econometric-simulation model used in this study. A detailed discussion of the methods and issues of four studies follow: two studies are early assessment studies for aldrin and trifluralin and two are academic studies incorporating more sophisticated economic analyses.

Delvo analyzed the economic effects of canceling the registration of aldrin, an organochlorine insecticide used on corn to control wireworms and cutworms, before its registration was canceled in 1975 (*5, 21*). State crop experts estimated the State-level effects on yield of the cancellation and of alternative insecticide use. Delvo used partial budgeting to estimate cost changes and used a price elasticity estimate from another study to estimate the price changes from lower corn production. Assuming acreage was constant under the set-aside program, Delvo analyzed cases where alternative pesticides were used and where they were not. In both cases, variable costs increased, production decreased, and prices increased. When alternative insecticides were used, corn prices increased less than 1 percent, the income of all corn producers increased, but the incomes of aldrin users decreased. When alternatives were not used, production losses and price increases were greater, and the income of all corn producers, including aldrin users, increased. In both cases, Delvo found that consumers suffered from higher prices and lower production, but no measure of consumer loss was estimated. Assuming land was brought into corn production to keep production and prices constant, Delvo found that estimated farm income decreased.

Trifluralin is a preemergence, dinitroaniline herbicide used on a wide variety of crops such as soybeans, cotton, and vegetables (*20*). Regulatory review of tri-

fluralin did not lead to its cancellation. The soybean assessment used similar methods to obtain yield and cost information and similar analytical methods as in the aldrin study. A longrun scenario assumed that there would be ample supplies of alternative herbicides for trifluralin-treated acreage. A shortrun scenario assumed that some acreage might not be treated because of shortages of alternative pesticides, even though pesticide prices were assumed constant. The shortrun estimated soybean price increased by $1.35 per bushel to $6.99 and the shortrun corn price decreased by $0.25 per bushel to $2.43. Soybean producers' income decreased but it increased for those not using trifluralin. Longrun soybean production losses and price increases were less than those in the short run. The estimated soybean price increased by $0.43 per bushel and corn decreased by $0.02 per bushel. As a result, the overall effects on agriculture and consumer expenditures were less.

Taylor and Frohberg used a linear programming model of the Corn Belt, including demand functions, to compute price changes and other effects of banning insecticides or herbicides on corn and soybeans in the Corn Belt (*18*). The model simulated the operation of a competitive market by maximizing consumers' plus producers' surplus. For the herbicide ban, corn yields were assumed to decrease by 19 percent and soybean yields by 22 percent (these estimates were based on long-term field plot research and were extrapolated to the entire Corn Belt). Two additional cultivations were also assumed. Simulated results showed that corn prices increased by $0.54 per bushel to $3.60, and soybean prices increased by $1.32 per bushel to $6.58. As a result, consumers' surplus decreased by $3.5 billion and producers' surplus increased by $1.8 billion. The insecticide ban primarily increased corn yield losses from corn rootworm larvae. Loss estimates varied by region and crop rotation. Results of banning insecticides resembled the pattern of banning herbicides but were smaller in magnitude.

Burton examined several herbicide regulatory scenarios using a mathematical programming model that included price-responsive domestic, export, and stock demand equations as well as regional land and labor supply equations (*2*). The model maximized consumers' plus producers' surplus from all marketed commodities. Weed scientists in the major producing States provided the yield loss estimates and identified weed control alternatives for each scenario. Burton examined bans on trifluralin; dinitroanilines; atrazine; triazines; phenoxys, dinitroanilines, and thiocarbamates; and all herbicides. He concluded that if alternatives were available and shifts in cropping patterns were possible, herbicide bans would not significantly affect U.S. agriculture even if several herbicide classes were restricted. However, large regional shifts in production could occur. Burton also concluded that the effects would be more severe if all herbicides were banned: most crop prices increased 10 to 16 percent, production decreased, and regional cash rents increased 16 to 66 percent. Producers gained and consumers lost.

Analytic Methods and Information

This report uses an econometric-simulation model to analyze the effects of potential bans on corn and soybean insecticides, nematicides, fungicides, and herbicides. This report analyzes the information from the *Pesticide Assessment of Field Corn and Soybeans*, assembled under the National Agricultural Pesticide Impact Assessment Program (NAPIAP).

The Pesticide Assessment of Field Corn and Soybeans

This prototype assessment departs from the traditional pesticide-by-pesticide approach used in regulatory analyses in that it considered the interdependence among pesticide regulatory decisions (*10-15*). Only Burton used a comparable information base (*2*). However, the *Pesticide Assessment of Field Corn and Soybeans* includes insecticides, fungicides, and herbicides and considers variations in pest problems and pest control practices by State. Personal enumeration used to assemble the information base also ensured a higher response rate than that achieved by Burton.

The pesticide assessments systematically review major pests; regional variation in pest problems, pesticide use, and pest management practices; and pesticide efficacies of yield. Research and extension experts in major corn and soybean producing States estimated yield losses and identified control alternatives assuming that important registered pesticides and combinations of pesticides were removed from the market. The assessment focused on insect, nematode, disease, and weed problems in 28 States, accounting for 97 percent of the corn and 98 percent of the soybean production during 1978-82.

The estimates were based on survey data, experimental and field research trials, and field experience. Results were recorded on a questionnaire designed to minimize overstatement of pesticide productivity and of effects of pesticide regulations (*17*). The reliance on expert opinion reflects the time and high cost required for sufficient experimental data on climatic, soil, and

other factors that determine the extent and the severity of current losses from pests and changes caused by withdrawing major pesticides from the market.

Analytical Model

TECHSIM, an analytical model, estimates changes in crop prices, production, and acreages and computes such welfare indicators as changes in crop rents and economic surpluses. The model considers interactions between supply and demand for major crops and contains many of the same concepts as those used by Burton and by Taylor and Frohberg (*2, 18*).

TECHSIM uses data representing technological or regulatory changes (per-acre cost and yield changes) and estimates changes in economic welfare for major segments of the agricultural economy (*4*). TECHSIM is a regional econometric-simulation model for the U.S. production and distribution of soybeans, corn, grain sorghum, wheat, barley, oats, cotton lint, and cottonseed. The model, which also includes the meal and oil products of cottonseed and soybeans, forecasts changes in per-acre and total profits for each of the modeled commodities in 13 domestic subregions for any number of years (table 1). More highly aggregated welfare changes are forecasted. Welfare changes include the net effect; the total profit changes for producers of each crop and all crops; the total profit changes for producers of meals and oils; and the sum of changes in consumers' surplus and profits for all producers involved in transforming raw agricultural commodities into final consumable products.

Modeling commodity markets helped estimate welfare changes. Estimated supply and demand functions for the commodities are linked in a recursive adjustment model. Annual production of each commodity is based on relative expected profitability of each commodity. Thus, farm-level decisions to maximize profits drive the model. When the cost of production or per-acre productivity of a crop is altered, the expected profitability of that crop relative to all others is altered, thereby inducing shifts in acres planted and production. The model is recursive in the sense that farm profits earned in one simulated year determine planting decisions in the next year.

The model operates through classes of equations. Acreage response functions are based on relative net returns, estimated for each commodity in each region where the crop is grown. Multiplying these functions by the associated per-acre production functions, summing across regions, and then adding inventories, yields the annual quantities supplied. Demands for each commodity consist of several components: feed, food, seed, mill, inventory, and export. Each component, estimated at the national level, is a function of its own and substitute prices. Equating supply with summed demand responses yields excess demand equations for each crop. Simultaneously solving the excess demand equations determines market prices and utilization patterns for the commodities. Prices, quantities, and costs of production allow calculation of regional crop-specific profit levels. Profits supply the links between simulated marketing years. Actual net returns are used as farmer expectations for net returns during the following year. This drives the acreage response functions by altering planted acreage the following year.

The model runs twice: first simulating operation of the commodity markets without the pesticide ban and then simulating the markets with the ban. These runs produce changes in prices, quantities, and acreage measures. Changes in farm income, its distribution,

Table 1 — TECHSIM production regions

Region	States
Appalachia	Kentucky, North Carolina, Tennessee, Virginia, West Virginia
Central Plains	Kansas, Nebraska
Corn Belt	Illinois, Indiana, Iowa, Missouri, Ohio
Delta	Arkansas, Louisiana, Mississippi
Lake States	Michigan, Minnesota, Wisconsin
Northeast	Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont
Northern Plains	North Dakota, South Dakota
Mountain States	Colorado, Idaho, Montana, Nevada, Utah, Wyoming
Pacific Northwest	Oregon, Washington
Southeast	Alabama, Florida, Georgia, South Carolina
Southern Plains	Oklahoma, Texas
Southwest	Arizona, New Mexico
West Coast	California

the welfare of some direct purchasers of agricultural commodities, and the welfare of consumers and food processors are then calculated. However, TECHSIM does not account for farm programs that may influence crop prices and production, such as price supports, target prices, and production control programs. The model excludes the accumulated inventories under price-support programs during the early eighties.

TECHSIM incorporates relatively new developments in welfare economics. Just and Hueth argued that when the Government imposes a price on a market, prices and profits are affected throughout the marketing chain (*9*). They showed consumers' and producers' surplus could be measured even in long, complex marketing chains. In vertically related industries, where the output of each industry is an input for the industry one step up the marketing chain, the welfare effects of an imposed price distortion in an initial or intermediate market on all forward industries (industries up the marketing chain) can be captured by measuring the change in consumers' surplus. That is, if a calculation to compute changes in consumers' surplus were carried out on an initial or intermediate-level general equilibrium demand function, the change should be interpreted as the change in final consumers' surplus plus the changes in all forward industry rents. Chavas and Collins generalized this analysis to include technological change or distortion (*3*). These ideas were incorporated in the TECHSIM calculations of all rents not at the farm level.

Scenarios and Estimates

Scenarios for insects, nematodes, and diseases were based on pest groups and methods of application: soil insecticides on corn, foliar insecticides on soybeans, nematicides on corn and soybeans, seed treatments on corn and soybeans, and foliar fungicides on soybeans. Scenarios were also developed for major herbicide groups: acetanilides, dinitroanilines, thiocarbamates, triazines, and postemergence herbicides. One, two, or a few chemicals, and then all pesticides used for a target pest or in an herbicide group were assumed to be removed from the market. Some scenarios assumed that, due to scarcity, farmers bid up the prices of alternative pesticides by 25 percent. The estimate of 25 percent was not based on an empirical observation but was chosen arbitrarily to show the results of pesticide price increases. The scenarios implicitly assumed enough time for ample quantities of alternative pesticides to be made available but not enough time for new pesticides to be developed.

TECHSIM uses estimated cost and percentage yield changes averaged over all acreage of the affected crop, not just the acreage treated with the pesticide(s) studied. The *Pesticide Assessment of Field Corn and Soybeans* provided estimates of yield loss averaged over all acreage (as needed by TECHSIM) and information to estimate the cost changes. Average cost changes were computed for the acreage treated with the pesticide(s), including the difference in cost between the regulated pesticide(s) and the alternative compounds plus the cost of additional cultural practices. This average cost change was then multiplied by the proportion of acreage treated with the regulated pesticide(s) to obtain the average cost change over all crop acreage. Estimates of acreages treated and changes in control practices were also obtained from the pesticide assessment. We used retail list prices as the prices of pesticides (*1*). State recommendations and pesticide surveys yielded the application rates (*7, 8, 19*).

Two types of information are presented to summarize the economic effects of different pesticide regulations. Welfare indicators are dollar measures of gains or losses accruing in subsectors of the agricultural economy. These measures include total crop rent, consumers' surplus and forward industry rents, and net effect. Economic variables are presented as changes from simulated base levels and include corn and soybean prices, production, and per-acre returns. The following welfare measures and economic variables are presented for each scenario analyzed:

- **Total crop rent** — The sum of changes in returns to all crops resulting from the imposed cost changes or decreases in productivity.
- **Consumers' surplus** — The sum of changes in forward industry rents and profits plus the change in consumers' surplus for consumers purchasing final products made from these crops. A negative consumers' surplus indicates losses — consumers and the food processing, transportation, and marketing industries paid more for less.
- **Net effect** — The sum of changes in total crop rent, meal and oil rents, and consumers' surplus and forward industry rents. This variable does not measure social welfare changes. A decrease in this variable shows that agricultural production possibilities have been reduced, and that those who gain from a regulation (excluding gains from reduced environmental and safety risks) have not gained so much that they could compensate the losers.

- **Prices of corn and soybeans** — The changes in price levels for each crop, measured in dollars per bushel.
- **Acreage planted to corn and soybeans** — The change in acreage planted to each crop.
- **Production of corn and soybeans** — The percentage change in production.
- **Annual returns per acre for corn and soybeans** — The change in annual returns per acre for each crop, measured in dollars.

The changes in all these measures are presented for model years 1 and 5 after the regulation mandating the removal of the pesticide, except for planted acreage which is presented for years 2 and 5. The modeled changes in these measures typically oscillated each year and settled to an equilibrium in about 5 model years. This report presents the first- and fifth-year results to show the initial and equilibrium changes from the base run. Planted acreage never changes in the first year, so the second year change is presented as the initial change. The fifth-year estimate should be viewed as an indicator of a new equilibrium value, not necessarily as a value after 5 years. TECHSIM has many characteristics of a cobweb model which may forecast greater oscillations of price and production, resulting in a longer time for markets to reach equilibrium than would really occur. The base run estimates for production, prices, and acreage are displayed in table 2. Although price supports were not included in the model, the baseline prices exceeded the support level. So, price changes were not overestimated because the initial price was less than the support level.

Table 2 — TECHSIM base simulation

Indicator	Estimate
Production:	*Million bushels*
Corn —	
Year 1	6,147.67
Year 5	6,174.16
Soybeans —	
Year 1	1,557.91
Year 5	1,562.21
Acreage:	*Million acres*
Corn —	
Year 2	67.71
Year 5	67.93
Soybeans —	
Year 2	57.74
Year 5	57.73
Price:	*Dollars per bushel*
Corn —	
Year 1	2.76
Year 5	2.69
Soybeans —	
Year 1	6.88
Year 5	6.74

Insecticides and Nematicides

Soil insecticides are the most widely used insecticides on corn. Roughly 35 to 40 percent of the U.S. corn acreage is treated annually with such soil insecticides as carbofuran, chlorpyrifos, disulfoton, ethoprop, fonofos, isofenfos, phorate, and terbufos. Corn rootworm larvae and other members of the soil complex are primary targets for these insecticides. Terminating soil insecticide treatments could reduce U.S. corn yields an average of 9 percent, more than the potential losses caused by terminating the treatment of any other corn insect (*16*). Some of the chemicals used as soil insecticides are used to control cutworms (chlorpyrifos) and European cornborers (carbofuran, fonofos) on corn, Mexican bean beetles on soybeans (carbofuran), and nematodes on both corn and soybeans (carbofuran, terbufos).

Foliar applications are the major soybean insecticide treatments. Roughly 2 to 5 percent of the U.S. soybean acreage receives a foliar application each year. The treated acreage is heavily concentrated in Appalachia, the Delta, and Southeast (see table 1 for regional and State delineations). If foliar insecticides were removed from the market, corn earworms could cause 3-percent losses in soybean yields; loopers, 2 to 3 percent; stinkbugs, 1 to 2 percent; velvetbean caterpillars, 1 to 2 percent; and Mexican bean beetles, 1 percent (*16*). Several foliar insecticides control more than one of these pests. Major insecticides used to control corn earworms include carbaryl, methomyl, methyl parathion, and permethrin, while acephate and chlorpyrifos are used less frequently. Methomyl, permethrin, and acephate are used to control soybean loopers; whereas carbaryl, methomyl, and methyl parathion are used to control stinkbugs. Methomyl, methyl parathion, and permethrin are used for velvetbean caterpillar control.

Several of the soil insecticides are also used as nematicides on corn and soybeans. About 3 to 4 percent of the U.S. corn and soybean acreage is treated each year for nematodes. Carbofuran and terbufos are the most commonly used corn nematicides, while aldicarb, carbofuran, and fenamiphos are the most commonly used soybean nematicides. Terminating nematicide treatments would decrease corn yields less than 1 percent and soybean yields 1 to 2 percent (*16*).

Insecticide and Nematicide Scenarios

The insecticide and nematicide scenarios are classified into three groups, based on target pest and method of application: soil insecticides, foliar insecticides, and nematicides.

Soil Insecticides

I1 — Terbufos and Isofenfos. There are several effective alternatives (carbofuran, chlorpyrifos, disulfoton, ethoprop, fonofos, and phorate) to terbufos and isofenfos, so withdrawing these two soil insecticides will not significantly affect corn or soybean yields. The Corn Belt and Lake States would incur minor yield losses from corn rootworm larvae. Because terbufos and isofenfos are in the middle of the price range for soil insecticides, it was assumed that farmers choose alternatives so that average control costs do not change in a region (table 3).

I2 — Terbufos and Isofenfos, 25-Percent Price Increase for Alternatives. This scenario has the same yield loss assumptions as scenario I1. To account for scarcity, it was assumed that farmers bid up prices for the chemicals in soil insecticides by 25 percent, resulting in a 25-percent corn rootworm control cost increase and minor cost increases for soybeans (table 3).

I3 — All Soil Insecticides. Banning all chemicals in soil insecticides would cause maximum corn yield losses from corn rootworm larvae and other soil insects, and some damage from European cornborers and nematodes. Some corn producers would use alternative controls for cutworms (fenvalerate for chlorpyrifos) and European cornborers (carbaryl, fenvalerate, methomyl, or permethrin for carbofuran or fonofos). Average corn pest control costs would decrease because there would be no treatment for corn rootworm larvae, but cornborer and cutworm control costs would increase slightly. Soybean pest control costs would increase slightly because more expensive alternatives would be needed for some pests (table 3).

Foliar Insecticides

I4 — Permethrin. Banning permethrin would increase soybean yield losses from loopers in Appalachia, the Delta, and the Southeast. Acephate was assumed to be the primary alternative to permethrin on loopers, and its use would increase control costs in those three regions. Equally effective and costly materials are available for corn earworm, velvetbean caterpillar, and Mexican bean beetle control. Since little permethrin is used, no significant yield losses or cost changes occur for corn (table 4).

Table 3 — Average cost and yield changes from banning soil insecticides on corn and soybeans

Crop and region	Scenario					
	I1		I2		I3	
	Yield loss	Cost change	Yield loss	Cost change	Yield loss	Cost change
	Percent	*Dollars per acre*	*Percent*	*Dollars per acre*	*Percent*	*Dollars per acre*
Corn:						
Appalachia	0	0	0	0.6	11.8	−2.1
Central Plains	0	0	0	1.4	11.3	−4.7
Corn Belt	0.2	0	0.2	1.3	9.1	−4.1
Delta	0	0	0	1.4	0	0
Lake States	.1	0	.1	.8	5.1	−2.7
Mountain States	0	0	0	1.4	11.3	−4.7
Northeast	0	0	0	.8	2.3	−3.1
Northern Plains	0	0	0	1.3	4.1	−4.8
Southeast	0	0	0	2.3	14.5	−9.2
Southern Plains	0	0	0	1.4	11.3	−4.7
Soybeans:						
Appalachia	0	0	0	.1	0	.2
Central Plains	0	0	0	0	0	0
Corn Belt	0	0	0	0	0	0
Delta	0	0	0	.1	0	.2
Lake States	0	0	0	0	0	0
Northeast	0	0	0	.1	0	.1
Northern Plains	0	0	0	0	0	0
Southeast	0	0	0	0	0	.1

I5 — Permethrin, Fenvalerate, and Methomyl. Soybean yield losses from loopers and corn earworms would increase in Appalachia, the Delta, and Southeastern States, and would be greater than losses in scenario I4. Control costs would remain the same (table 4).

I6 — Permethrin, Fenvalerate, and Methomyl, 25-Percent Price Increase for Alternatives. Yield losses would be the same as in scenario I5, but control costs of all foliar pesticides for soybeans would increase by 25 percent (table 4).

I7 — All Foliar Sprays. Corn earworms, velvetbean caterpillars, and stinkbugs cause major soybean losses in Appalachia, the Delta, and Southeastern States. The Corn Belt, Northeast, and Lake States would suffer losses of about 1 percent. Pest control costs would decrease if foliar sprays were no longer applied (table 4).

Nematicides

I8 — All Nematicides. This scenario bans aldicarb, carbofuran, ethoprop, fenamiphos, fensulfothion, and terbufos. Corn rootworm larvae would cause yield losses because carbofuran, ethoprop, and terbufos are used for its control. This scenario assumes maximum nematode damage to corn and soybeans. However, of the 11.2-percent corn yield loss in the Southeast, 7.3 percent would be caused by southern corn rootworms. Corn rootworm losses would occur in no other regions (table 5).

Table 4 — Average cost and yield changes from banning foliar insecticides on soybeans

Region	Scenario					
	I4		I5		I6	
	Yield loss	Cost change	Yield loss	Cost change	Yield loss	Cost change
	Percent	*Dollars per acre*	*Percent*	*Dollars per acre*	*Percent*	*Dollars per acre*
Appalachia	0.1	0.1	1.5	0.1	1.5	0.3
Corn Belt	0	0	0	0	0	.1
Delta	.6	.2	3.2	.2	3.2	.6
Lake States	0	0	0	0	0	.1
Northeast	0	0	0	0	0	.1
Southeast	9.0	.2	16.4	.2	16.4	.9

Table 5 — Average cost and yield changes from banning foliar insecticides or nematicides on corn and soybeans

Crop and region	Scenario					
	I7		I8		I9	
	Yield loss	Cost change	Yield loss	Cost change	Yield loss	Cost change
	Percent	*Dollars per acre*	*Percent*	*Dollars per acre*	*Percent*	*Dollars per acre*
Corn:						
Appalachia	0	0	1.2	−1.6	1.2	−1.4
Central Plains	0	0	0	0	0	1.4
Corn Belt	0	0	.7	−.9	.7	.2
Lake States	0	0	.1	−.4	.1	.3
Northeast	0	0	0	0	0	.8
Northern Plains	0	0	0	0	0	1.3
Southeast	0	0	11.2	−8.1	11.2	−8.1
Southern Plains	0	0	0	0	0	1.4
Soybeans:						
Appalachia	7.2	−1.8	3.0	−3.3	3.0	−3.3
Corn Belt	.9	−.6	.7	−.4	.7	−.4
Delta	19.5	−2.9	2.8	−1.4	2.8	−1.4
Northeast	1.2	−3.0	.4	−.3	.4	−.3
Southeast	54.3	−4.9	3.4	−1.4	3.4	−1.4

I9 — All Nematicides, 25-Percent Price Increase for Alternative Insecticides. This scenario assumes that the prices of all materials that control corn rootworms and European cornborers increase by 25 percent if all nematicides were removed from the market (table 5).

Effects of the Insecticide and Nematicide Scenarios

After a 5-year ban of all soil insecticides, the net effect would be a $2.2-billion loss, all foliar insecticides would cause about a $700-million loss, and all nematicides would cause about a $200-million loss. Banning a small number of soil or foliar insecticides would have less severe results than would banning all nematicides. Banning all insecticides used for an important corn or soybean pest would have a much greater effect than would banning a few soil or foliar insecticides but leaving some effective alternatives for each pest. In all scenarios, except those which ban terbufos and isofenfos (scenarios I1 and I2), the transfer of income from consumers to producers would far exceed the net effect (tables 6-8).

Because of the magnitude of the predicted yield losses and their concentration in the Southeast and Delta States, potential bans on permethrin or permethrin, fenvalerate, and methomyl could have greater effects than would banning one or two soil insecticides. (There is no guarantee that one could pick any other set of foliar insecticides and achieve this same result.) In either case, the economic effects would be relatively small. Corn prices would not vary by more than $0.04 per bushel, production would not decrease by more than 0.1 percent, and corn returns would not change by more than about $3.00 per acre (after 5 years). Soybean prices would not change by more than $0.33 per bushel and returns would not increase by more than $7.50 per acre (after 5 years). If permethrin, fenvalerate, and methomyl were banned, production may initially decrease by more than 1 percent, but by less than 1 percent after 5 years (tables 6 and 7). Decreases would be small because alternative pesticides are available to control insects and nematodes.

Increasing the prices of alternative insecticides by 25 percent (scenarios I2, I6, and I9) would not significantly affect prices and production. However, corn and soybean producers would bear most of the additional cost. Scenario I2 shows small per-acre losses for corn and soybeans.

Withdrawing all compounds available for soil insects, foliar insects, or nematodes would cause greater effects. Corn returns would increase after 5 years by $51 per acre if all soil insecticides were banned, by $15 if all foliars were banned, and by $7 if all nematicides were banned. If all soil insecticides were banned, corn prices would increase by almost $0.80 per bushel and production would decrease by almost 6 percent. If all foliar insecticides or nematicides were banned, corn prices would increase by $0.20 per bushel or less and production would decrease by about 1 percent or less. Soybean returns would increase by about $21 per acre if soil insecticides were banned, $33 if foliar insecticides were banned, and $9 if all nematicides were banned. If all foliar insecticides were banned, soybean prices would increase by almost $1.50 per bushel and production would decrease by about 2

Table 6 — Economic effects of removing soil insecticides from the market

Effects	Scenario		
	I1	I2	I3
Welfare effects:	*Million dollars*		
Total crop rent —			
Year 1	46.6	-37.9	3,394.0
Year 5	70.3	-7.2	5,984.8
Consumers' surplus —			
Year 1	-66.5	-56.2	-4,828.1
Year 5	-96.6	-114.8	-8,132.1
Net effect —			
Year 1	-19.9	-94.2	-1,434.1
Year 5	-26.3	-107.6	-2,148.2
Price change:	*Dollars per bushel*		
Corn —			
Year 1	.01	.01	.70
Year 5	.01	.02	.79
Soybeans —			
Year 1	-.01	-.01	.05
Year 5	.01	<.01	.86
Acreage change:	*Million acres*		
Corn —			
Year 2	.03	.04	1.90
Year 5	.03	*	2.06
Soybeans —			
Year 2	-.01	.03	-1.16
Year 5	<.01	*	-.43
Production change:	*Percent*		
Corn —			
Year 1	-.10	-.10	-6.80
Year 5	-.07	-.10	-6.10
Soybeans —			
Year 1	0	0	0
Year 5	.01	0	-1.20
Change in returns:	*Dollars per acre*		
Corn —			
Year 1	.55	-.66	39.74
Year 5	.65	-.19	51.34
Soybeans —			
Year 1	.02	-.02	1.08
Year 5	.19	-.09	21.28

*Decrease of less than 10,000 acres.

percent after 5 years. Banning all soil insecticides would increase soybean prices by $0.86 per bushel and would decrease production by about 1 percent after 5 years. Banning all nematicides would cause smaller price and production changes for soybeans. Effects on corn of banning foliar insecticides would primarily be a response to changes in soybean yields and returns since foliar insecticides are seldom used on corn. Likewise, effects on soybeans of banning soil insecticides would primarily be a response to changes in corn yields and returns since soil insecticides are seldom used on soybeans (tables 6-8).

Fungicides

Seed treatments are the major fungicide applications for both corn and soybeans. Almost all of the corn seed and a third of the soybean seed are annually treated to control seed rots and seedling blights. If seed were no longer treated, average corn yields would initially decrease by 5 percent and soybean yields by 2 percent (*16*). The major compounds used in seed treatments are captan, carboxin, and thiram, all of which are equally effective in many, but not all, environmental situations.

Table 7 — Economic effects of removing foliar insecticides from the market

Effects	Scenario			
	I4	I5	I6	I7
	Million dollars			
Welfare effects:				
Total crop rent —				
Year 1	296.2	748.4	735.8	3,385.6
Year 5	284.6	704.7	698.6	3,200.1
Consumers' surplus —				
Year 1	- 361.9	- 913.7	- 913.7	- 4,168.4
Year 5	- 351.7	- 868.7	- 875.6	- 3,877.2
Net effect—				
Year 1	- 65.7	- 165.3	- 177.9	- 782.8
Year 5	- 67.1	- 164.0	- 177.0	- 677.0
	Dollars per bushel			
Price change:				
Corn—				
Year 1	.01	.02	.02	.07
Year 5	.02	.04	.04	.18
Soybeans —				
Year 1	.22	.55	.55	2.57
Year 5	.13	.33	.33	1.46
	Million acres			
Acreage change:				
Corn —				
Year 2	- .17	- .42	- .42	- 1.85
Year 5	- .06	- .14	- .15	- .69
Soybeans —				
Year 2	.27	.71	.69	3.15
Year 5	.19	.49	.49	2.39
	Percent			
Production change:				
Corn —				
Year 1	0	0	0	0
Year 5	- .10	- .20	- .26	- 1.20
Soybeans —				
Year 1	- .80	- 1.50	- 1.50	- 6.80
Year 5	- .20	- .05	- .05	- 2.00
	Dollars per acre			
Change in returns:				
Corn —				
Year 1	.52	1.32	1.32	6.17
Year 5	1.35	3.27	3.29	14.59
Soybeans —				
Year 1	4.67	11.80	11.58	53.20
Year 5	3.01	7.44	7.32	33.16

Foliar fungicides are applied annually on 5 percent or less of the soybean acreage and on a negligible amount of the corn acreage. Terminating these treatments could cause average soybean yields to decrease by about 2 percent and could cause negligible corn losses (*16*). Foliar treatments to soybeans, primarily benomyl, are applied mostly in the Delta. Other effective fungicides include chlorothalonil, thiabendazole, and thiophanate-methyl.

Fungicide Scenarios

The fungicide scenarios are classified into two groups, based on target pest and timing of application: seed treatments and foliar fungicides.

Table 8 — Economic effects of removing nematicides from the market

Effects	Scenario	
	I8	I9
Welfare effects:	*Million dollars*	
Total crop rent —		
Year 1	1,043.6	982.6
Year 5	1,127.4	1,079.3
Consumers' surplus —		
Year 1	- 1,193.7	- 1,183.8
Year 5	- 1,316.5	- 1,324.5
Net effect —		
Year 1	- 150.0	- 201.2
Year 5	- 189.2	- 245.2
Price change:	*Dollars per bushel*	
Corn —		
Year 1	.07	.07
Year 5	.09	.09
Soybeans —		
Year 1	.47	.47
Year 5	.35	.34
Acreage change:	*Million acres*	
Corn —		
Year 2	- .11	- 1.64
Year 5	.11	.08
Soybeans —		
Year 2	.59	.62
Year 5	.43	.43
Production change:	*Percent*	
Corn —		
Year 1	- .70	- .70
Year 5	- .60	- .60
Soybeans —		
Year 1	- 1.20	- 1.20
Year 5	- .50	- .50
Change in returns:	*Dollars per acre*	
Corn —		
Year 1	5.54	4.84
Year 5	7.04	6.50
Soybeans —		
Year 1	10.96	10.96
Year 5	8.85	8.61

Seed Treatments

F1 — Captan. Banning captan would only slightly affect yield and cost for corn and soybeans because of thiram's (an effective alternative) availability. Only the Lake States would suffer a 1.3-percent corn yield loss (table 9).

F2 — Captan, 25-Percent Price Increase for Alternatives. This scenario assumes the same yield changes as in scenario F1 but greater cost changes from higher prices for alternative foliar fungicides (table 8).

F3 — All Seed Treatments. This scenario would cause maximum corn and soybean yield losses from seed rots and seedling blights. Corn yield losses as high as 11 percent would occur in the Northeast and Plains States. Pest control costs would decrease because seed would no longer be treated against pests (table 9).

Foliar Fungicides

F4 — Benomyl. Thiophanate-methyl was assumed to be the primary alternative to benomyl. Soybean yield losses approaching 5 percent would occur in the Delta States, but would be negligible elsewhere. Benomyl and thiophanate-methyl are comparably priced so control costs would not increase (table 10).

F5 — Benomyl, 25-Percent Price Increase for Alternatives. This scenario assumes the same yield losses as in scenario F4, but soybean pest control costs would increase in the Corn Belt, Delta, Appalachia, Southeast, and Northeast (table 10).

F6 — All Foliar Fungicides. Soybean yield losses approaching 10 percent would occur in the Delta States, with very small losses in the Corn Belt and Appalachia. Soybean pest control costs would decrease because foliar fungicides would no longer be applied (table 10).

Effects of the Fungicide Scenarios

Projected effects of banning captan or benomyl are small; banning all seed treatments affects U.S. production much more than would banning either of these fungicides. However, banning all foliar fungicides would have slightly greater effects than would banning one of the fungicides. After a 5-year ban of benomyl or captan, the net effect would vary between a $70- to a $100-million loss. Banning all foliar fungicides would cause a net loss of about $130 million, but banning all seed treatments would increase the net loss to $1.2 billion. In all cases, returns to farmers would increase but consumers would bear a cost. The largest increases in farmers' gains and consumers' losses

would occur if all seed treatments were banned. As with insecticides, the income transfers from consumers to producers would be greater than the net effects (tables 11 and 12).

Results of banning a single fungicide would be comparable with results of banning a few insecticides. If the prices of alternatives to captan or benomyl increased by 25 percent, additional effects would be negligible, but the returns to farmers growing corn or soybeans would decrease. Banning captan would increase both corn and soybean prices by $0.01 to $0.03 per bushel. Banning benomyl would increase corn prices by $0.02 and soybean prices by $0.16 per bushel. Removing captan from the market would increase the returns to both crops by less than $1.00 per acre. Banning benomyl would increase corn returns by about $1.40 per acre and soybean returns by about $3.50 per acre. Increasing the prices of benomyl alternatives by 25 percent would increase the returns to soybeans by about $3.40 per acre. The results of withdrawing captan or benomyl from the market would be small because effective alternatives are available.

Banning all seed treatments would have smaller effects than would banning all soil insecticides, but greater

Table 9 — Average cost and yield changes from banning seed treatments on corn and soybeans

Crop and region	Scenario					
	F1		F2		F3	
	Yield loss	Cost change	Yield loss	Cost change	Yield loss	Cost change
	Percent	*Dollars per acre*	*Percent*	*Dollars per acre*	*Percent*	*Dollars per acre*
Corn:						
Appalachia	0	0.37	0	0.70	4.2	−0.95
Central Plains	0	.29	0	.60	11.2	−.93
Corn Belt	0	.41	0	.75	.7	−.91
Delta	0	.19	0	.58	1.2	−1.37
Lake States	1.3	.44	1.3	.77	5.1	−.88
Mountain States	0	.29	0	.60	11.2	−.93
Northeast	0	.37	0	.69	11.3	−.93
Northern Plains	0	.33	0	.81	7.6	−1.56
Southeast	0	.32	0	.65	2.1	−1.02
Southern Plains	0	.29	0	.60	11.2	−.93
Soybeans:						
Appalachia	0	.01	0	.04	1.3	−.08
Central Plains	0	.01	0	.01	2.7	−.03
Corn Belt	0	.02	0	.06	1.0	−.10
Delta	0	.04	0	.09	.5	−.21
Lake States	0	.10	0	.19	.3	−.31
Northeast	0	0	0	0	.6	−.01
Northern Plains	0	.01	0	.01	0	−.02
Southeast	0	0	0	.02	.3	−.05

Table 10 — Average cost and yield changes from banning foliar fungicides on soybeans

Region	Scenario					
	F4		F5		F6	
	Yield loss	Cost change	Yield loss	Cost change	Yield loss	Cost change
	Percent	*Dollars per acre*	*Percent*	*Dollars per acre*	*Percent*	*Dollars per acre*
Appalachia	0	0	0	0.06	0.4	−0.37
Corn Belt	0	0	0	.03	.2	−.19
Delta	4.8	0	4.8	.50	9.7	−2.99
Northeast	0	0	0	.09	0	−1.31
Southeast	0	0	0	.21	0	−.56

effects than would banning all foliar insecticides or all nematicides. Banning all foliars would have an effect only slightly greater than banning benomyl. Banning all seed treatments would cause corn prices to increase by $0.39 per bushel, production to decrease by 3 percent, and returns to increase by $26 per acre (after 5 years). The same ban would cause soybean prices to increase by $0.90 per bushel, production to decrease by about 1 percent, and returns to increase by $21 per acre. Banning all foliar fungicides would cause soybean production to decrease by less than 1 percent and would cause negligible decreases in corn production. Corn prices would increase by about $0.04 per bushel and returns by $3 per acre. Soybean prices would increase by $0.35 per bushel and returns by about $8 per acre.

Herbicides

By using one or more currently available herbicides with tillage and cultural practices, corn and soybean farmers can control a wide variety of weed species. Different herbicide compounds do not control every

Table 11 — Economic effects of removing seed treatments from the market

Effects	Scenario		
	F1	F2	F3
Welfare effects:	*Million dollars*		
Total crop rent —			
Year 1	46.9	21.9	2,331.8
Year 5	112.2	95.1	3,506.6
Consumers' surplus —			
Year 1	−105.7	−101.6	−3,129.8
Year 5	−183.6	−192.3	−4,717.1
Net effect —			
Year 1	−57.0	−79.8	−780.0
Year 5	−71.4	−96.1	−1,150.6
Price change:	*Dollars per bushel*		
Corn —			
Year 1	.02	.02	.32
Year 5	.02	.02	.39
Soybeans —			
Year 1	<.01	<.01	.61
Year 5	.03	.02	.91
Acreage change:	*Million acres*		
Corn —			
Year 2	.01	.01	.46
Year 5	.02	.02	.70
Soybeans —			
Year 2	−.03	−.02	.19
Year 5	.01	.01	.33
Production change:	*Percent*		
Corn —			
Year 1	*	*	−3.8
Year 5	*	*	−2.9
Soybeans —			
Year 1	0	0	−1.6
Year 5	*	*	−1.3
Change in returns:	*Dollars per acre*		
Corn —			
Year 1	.40	.16	19.28
Year 5	.90	.70	26.33
Soybeans —			
Year 1	**	−.04	13.33
Year 5	.60	.52	21.40

*Decrease of less than 0.01 percent.
**Decrease of less than $0.01 per acre.

Table 12 — Economic effects of removing foliar fungicides from the market

Effects	Scenario		
	F4	F5	F6
Welfare effects:	*Million dollars*		
Total crop rent —			
Year 1	375.7	368.4	882.4
Year 5	318.1	313.0	729.9
Consumers' surplus —			
Year 1	−454.5	−454.5	−998.4
Year 5	−394.3	−396.4	−857.4
Net effect —			
Year 1	−78.8	−86.1	−136.0
Year 5	−76.2	−83.4	−127.5
Price change:	*Dollars per bushel*		
Corn —			
Year 1	.01	.01	.02
Year 5	.02	.02	.04
Soybeans —			
Year 1	.27	.27	.60
Year 5	.16	.16	.34
Acreage:	*Million acres*		
Corn —			
Year 2	−.21	−.21	−.45
Year 5	−.51	−.51	−.11
Soybeans —			
Year 2	.46	.45	1.01
Year 5	.26	.26	.59
Production change:	*Percent*		
Corn —			
Year 1	0	0	0
Year 5	−.1	−.1	−.2
Soybeans —			
Year 1	−.7	−.7	−1.6
Year 5	−.2	−.2	−.5
Change in returns:	*Dollars per acre*		
Corn —			
Year 1	.65	.65	1.44
Year 5	1.41	1.42	3.01
Soybeans —			
Year 1	5.93	5.81	13.84
Year 5	3.46	3.37	8.15

weed species with equal effectiveness, nor do they perform equally well under various soil and climatic conditions. If an herbicide is removed from the market, farmers who used it will be forced to use other compounds and perhaps change cultural practices (for example, change tillage system or increase cultivation). Situations may result where the control of some weed species is poorer and crop yields decrease despite other compounds and cultural practices being used. This section considers the effects of removing a number of widely used herbicides and chemically related herbicide groups, including acetanilides (alachlor and metolachlor), triazines (atrazine, cyanazine, metribuzin, and simazine), thiocarbamates (butylate + and EPTC +), and dinitroanilines (oryzalin, pendimethalin, and trifluralin). The individual compounds are alachlor; atrazine; metribuzin; and several postemergence herbicides such as bentazon, linuron, and 2,4-D.

Atrazine is the most widely used triazine on corn. More than 70 percent of the U.S. corn acreage is treated with one or more triazines, with almost 60 percent receiving an atrazine treatment. If all triazines were removed from the market, average U.S. corn yields would decrease by about 10 percent; and corn yields would decrease by 2 to 3 percent if only atrazine were removed from the market (*16*). About 30 to 40 percent of the soybean acreage is annually treated with metribuzin. Average U.S. soybean yields would decrease by 2 to 3 percent if metribuzin were removed from the market.

Approximately 50 percent of the corn acreage is treated with acetanilides; about 30 percent of the acreage is treated with alachlor and the remaining with metolachlor. If acetanilides were removed from the market, U.S. corn yields would decrease by about 6 percent, but yields would decrease by less than 0.1 percent if only alachlor were removed. Acetanilides are used almost as widely on soybeans as on corn, on about 40 percent of the acreage. Alachlor is annually applied to about 30 percent of the soybean acreage. U.S. soybean yields would decrease by about 3 percent if acetanilides were removed from the market and by less than 0.1 percent if alachlor were removed (*16*).

Thiocarbamates are used on about 20 percent of the corn acreage and on 1 percent of the soybean acreage. Most of the thiocarbamate-treated corn acreage receives butylate + , about 16 percent, and the remaining 4 percent receives EPTC + . Corn yields would decrease by about 3 percent without thiocarbamates. Dinitroanilines are applied to 40 to 45 percent of the soybean acreage and to about 1 percent of the corn acreage. Trifluralin, the primary dinitroaniline used on soybeans, is applied to 40 percent of the acreage. However, oryzalin and pendimethalin are also used. Without dinitroanilines, U.S. soybean yields would decrease by about 4 percent (*16*).

Postemergence herbicides are used to control weeds that have started growing in the field. Bentazon and linuron are two important soybean postemergence herbicides, applied to 10 to 15 and 25 percent of the acreage, respectively. U.S. soybean yields would decrease by about 4 percent if bentazon were removed from the market and by about 1 percent if linuron were removed. An important corn postemergence herbicide, 2,4-D, is applied to 10 to 15 percent of the corn acreage. U.S. corn yields would decrease by about 2 percent if 2,4-D were removed from the market. Dicamba, which is not considered further, is used on a comparable corn acreage as 2,4-D and would cause similar losses if removed from the market (*16*).

Herbicide Scenarios

Herbicide regulatory scenarios include both yield and cost changes. The experts did not estimate cost changes but instead identified alternatives including pesticide, tillage, and cultural practices. A cost was then developed for each alternative listed by the experts, and a modified average cost change was estimated for each region. Farmers use many practices; little is known about their choice criteria and even less is known about shifts under restricted choice sets. It was assumed that farmers would generally not use expensive pesticides developed for specialized purposes or older, cheaper alternatives unless they were commonly identified by State experts. The average cost was midway between the high- and low-cost alternatives in the set under consideration. In addition, a change in timing from preemergence or postemergence to preplant incorporated requires an extra pass over the field. For some scenarios, extra cultivations were deemed necessary. An extra pass over the field was assumed to cost $5 per acre (*6*).

Acetanilides

H1 — Alachlor. This scenario assumes that farmers use metolachlor as the alternative herbicide. Average pest control costs would increase slightly because metolachlor is more expensive than alachlor. Corn yield losses approaching 7 percent were assumed for Appalachia if alachlor were removed from the market, while average losses would be less than 1 percent in the Southeast. Soybean yield losses would occur only in the Lake States and would be less than 1 percent (table 13).

H2—All Acetanilides. Depending upon the region and tillage system, farmers may use cyanazine, simazine, butylate +, pendimethalin, amiben, dicamba, linuron, paraquat, or ametryn on corn. Atrazine was not assumed to be an alternative because it is very often mixed with acetanilides. Alternative pest controls for soybeans include trifluralin; pendimethalin; oryzalin; and several postemergence herbicides such as bentazon, acifluorfen, sethoxydim, fluazifop-butyl, metribuzin, and paraquat. If acetanilides were removed from the market, average corn yield losses would approach or exceed 10 percent in Appalachia, the Delta States, the Lake States, and the Northern Plains. Average corn yield losses would exceed 4 percent in all remaining regions except the Southeast. Average soybean yield losses could be approximately 27 percent in the Northeast, 5 percent in the Corn Belt, and 0 to 1 percent in the remaining regions. Average control costs would increase by several dollars per acre for corn and generally less than $1 per acre for soybeans (table 13).

H3 — All Acetanilides, 25-Percent Price Increase for Corn and Soybean Herbicides. This scenario assumes the same losses and alternatives as in scenario H2. Because acetanilides constitute a large portion of the corn and soybean herbicide use, it was assumed that the prices of all herbicides for these crops are bid up 25 percent due to scarcity (table 13).

Triazines

H4 — Atrazine. Atrazine is used only on corn. Alternatives include thiocarbamates, acetanilides, simazine, cyanazine, 2,4-D, dicamba, paraquat, and glyphosate. Removal of atrazine would result in corn yield losses of approximately 15 percent in the Northeast, 7 percent in the Northern Plains, 4 percent in Appalachia, and 2 percent or less in the remaining regions. Control cost increases are greater for banning atrazine than for banning acetanilides (table 14).

H5 — Metribuzin. This triazine is used only on soybeans. Alternatives include acetanilides; vernolate; and a number of postemergence herbicides such as 2,4-DB, bentazon, acifluorfen, chloramben, dyanap, and linuron. An extra cultivation was assumed in the Southeast. If metribuzin were removed from the market, soybean yields would decrease by about 11 percent in the Central Plains, 3 percent in Appalachia and the Delta, and 1 percent or less in the remaining regions. Average control costs would change by less than $1 per acre (table 14).

H6 — All Triazines. For corn, the alternatives are the same as for atrazine, excluding simazine and cyanazine. However, two extra cultivations were assumed for all acreage currently treated with triazines.

Table 13 — Average cost and yield changes from banning acetanilide herbicides on corn and soybeans

Crop and region	Scenario					
	H1		H2		H3	
	Yield loss	Cost change	Yield loss	Cost change	Yield loss	Cost change
	Percent	*Dollars per acre*	*Percent*	*Dollars per acre*	*Percent*	*Dollars per acre*
Corn:						
Appalachia	6.6	0.76	12.8	3.50	12.8	8.50
Central Plains	0	.40	4.3	1.60	4.3	4.90
Corn Belt	0	.74	4.6	3.50	4.6	7.10
Delta	0	.52	10.9	3.10	10.9	21.20
Lake States	0	.85	9.4	3.20	9.4	6.00
Mountain States	0	.40	4.3	1.60	4.3	4.90
Northeast	0	.56	7.6	2.70	7.6	6.55
Northern Plains	0	.45	8.6	1.80	8.6	4.00
Southeast	.3	.58	.3	2.70	.3	5.95
Southern Plains	0	.40	4.3	1.60	4.3	4.90
Soybeans:						
Appalachia	0	.54	.8	.60	.8	7.30
Central Plains	0	.62	0	.50	0	3.40
Corn Belt	0	.53	4.8	1.65	4.8	6.05
Delta	0	.13	0	.40	0	5.70
Lake States	.1	.43	.4	.40	.4	4.00
Northeast	0	.56	26.8	.90	26.8	6.80
Northern Plains	0	.16	0	.20	0	3.50
Southeast	0	.48	.6	.40	.6	7.20

If all triazines were removed from the market, corn yield losses would be large, exceeding 30 percent in the Northeast, 20 percent in the Delta, 10 percent in the Lake States and Appalachia, and 7 percent in the Corn Belt, Northern Plains, and Southeast. Control cost increases are also high because of the added cultivations. For soybeans, the scenario is the same as for banning metribuzin (table 14).

H7 — All Triazines, 25-Percent Price Increase for All Corn and Soybean Herbicides. This scenario is the same as scenario H6 except that farmers were assumed to bid up the prices of all corn and soybean herbicides due to scarcity (table 15).

Thiocarbamates and Dinitroanilines

H8 — All Thiocarbamates. Butylate + and EPTC + are used only on corn. Alternatives include acetanilides, atrazine, cyanazine, pendimethalin, bentazon, ametryn, linuron, paraquat, and glyphosate. One additional cultivation was assumed in Appalachia and the Southeast. If all thiocarbamates were removed from the market, losses would be about 11 percent in Appalachia, 5 percent in the Central and Southern Plains and Mountain regions, and 3 percent in the Corn Belt. Control costs would decrease by several dollars per acre except in the Southeast (table 15).

H9 — All Dinitroanilines. These compounds are used primarily on soybeans. Alternatives include acetanilides, glyphosate, acifluorfen, fluazifop-butyl, and sethoxydim. If all dinitroanalines were removed from the market, soybean yield losses would approach 11 percent in the Central Plains, 8 percent in the Delta, 5 percent in the Corn Belt, and 3 percent in Appalachia and the Lake States. Pest control costs would increase by several dollars per acre (table 15).

Postemergence Herbicides

H10 — Bentazon. This postemergence herbicide is used primarily on soybeans. Alternatives include metribuzin, acifluorfen, linuron, dyanap, and 2,4-DB. If bentazon were removed from the market, soybean yield losses would be about 8 percent in the Delta and Northeast, 5 percent in the Corn Belt, and 2 percent in Appalachia and the Lake States. Control costs would decrease by several dollars per acre (table 16).

H11 — Linuron. This postemergence herbicide is also primarily used on soybeans. Alternatives include metribuzin, bentazon, acifluorfen, chloramben, and 2,4-DB. If linuron were removed from the market, soybean yield losses of 15 percent would occur in the Northeast but would be 2 percent or less in all remaining regions. Pest control costs would decrease slightly in all regions (table 16).

Table 14 — Average cost and yield changes from banning triazine herbicides on corn and soybeans

Crop and region	Scenario					
	H4		H5		H6	
	Yield loss	Cost change	Yield loss	Cost change	Yield loss	Cost change
	Percent	*Dollars per acre*	*Percent*	*Dollars per acre*	*Percent*	*Dollars per acre*
Corn:						
Appalachia	4.0	7.10	0	0	18.1	19.40
Central Plains	.7	7.30	0	0	.7	13.00
Corn Belt	1.4	4.10	0	0	8.3	13.40
Delta	1.6	6.90	0	0	20.2	9.80
Lake States	1.4	3.10	0	0	11.3	9.80
Mountain States	.7	7.30	0	0	.7	13.00
Northeast	14.9	6.90	0	0	31.7	18.40
Northern Plains	7.1	.80	0	0	7.1	6.40
Southeast	1.1	6.60	0	0	7.3	16.70
Southern Plains	.7	7.30	0	0	.7	13.00
Soybeans:						
Appalachia	0	0	2.5	.02	2.5	.02
Central Plains	0	0	10.8	.02	10.8	.02
Corn Belt	0	0	.5	.10	.5	.10
Delta	0	0	3.4	-.80	3.4	-.80
Lake States	0	0	.4	.20	.4	.20
Northeast	0	0	0	0	0	0
Northern Plains	0	0	0	.04	0	.04
Southeast	0	0	.9	.16	.9	.16

Table 15 — Average cost and yield changes from banning triazine, thiocarbamate, and dinitroaniline herbicides on corn and soybeans

Crop and region	Scenario					
	H7		H8		H9	
	Yield loss	Cost change	Yield loss	Cost change	Yield loss	Cost change
	Percent	*Dollars per acre*	*Percent*	*Dollars per acre*	*Percent*	*Dollars per acre*
Corn:						
Appalachia	15.1	24.40	11.1	-1.00	0	0
Central Plains	.7	16.30	5.3	-1.70	0	0
Corn Belt	8.3	17.00	3.0	-.80	0	0
Delta	20.2	27.80	.1	-1.90	0	0
Lake States	11.3	12.60	.1	-.80	0	0
Mountain States	.7	16.30	5.3	-1.70	0	0
Northeast	31.7	22.15	.6	-.40	0	0
Northern Plains	7.1	8.60	0	-1.60	0	0
Southeast	7.3	19.95	1.4	.30	0	0
Southern Plains	.7	16.30	5.3	-1.70	0	0
Soybeans:						
Appalachia	2.5	6.72	0	0	2.6	0.80
Central Plains	10.8	2.92	0	0	10.8	1.90
Corn Belt	.5	4.50	0	0	4.9	.80
Delta	3.4	6.20	0	0	6.0	1.90
Lake States	.4	3.80	0	0	2.8	1.30
Northeast	0	5.90	0	0	0	0
Northern Plains	0	3.34	0	0	1.9	2.40
Southeast	.9	6.96	0	0	.6	.70

Table 16 — Average cost and yield changes from banning postemergence herbicides on corn and soybeans

Crop and region	Scenario					
	H10		H11		H12	
	Yield loss	Cost change	Yield loss	Cost change	Yield loss	Cost change
	Percent	*Dollars per acre*	*Percent*	*Dollars per acre*	*Percent*	*Dollars per acre*
Corn:						
Appalachia	0	0	0	0	2.8	0.30
Central Plains	0	0	0	0	0	.40
Corn Belt	0	0	0	0	2.0	.30
Delta	0	0	0	0	.9	.20
Lake States	0	0	0	0	.4	.90
Mountain States	0	0	0	0	0	.40
Northeast	0	0	0	0	2.1	.10
Northern Plains	0	0	0	0	8.6	1.40
Southeast	0	0	0	0	0	.70
Southern Plains	0	0	0	0	0	.40
Soybeans:						
Appalachia	2.3	-1.50	1.0	-0.40	0	0
Central Plains	.6	-.40	0	-.07	0	0
Corn Belt	4.9	-1.60	.1	-.20	0	0
Delta	8.0	-2.20	0	-.38	0	0
Lake States	1.8	-.80	.1	-.05	0	0
Northeast	7.6	-.60	15.2	-1.20	0	0
Northern Plains	0	-.90	1.6	-.03	0	0
Southeast	.7	-1.60	.3	-.30	0	0

H12 — 2,4-D. This postemergence herbicide is used primarily on corn. The primary alternative is dicamba, but farmers may also use atrazine or cyanazine in some States. If 2,4-D were removed from the market, corn yield losses would reach almost 9 percent in the Northern Plains; 2 to 3 percent in Appalachia, the Corn Belt, and Northeast; and less than 1 percent in the remaining regions. Control costs would increase slightly in all regions (table 16).

Effects of the Herbicide Scenarios

Banning an entire group of chemically related herbicides would have greater effects on crop production than would banning an individual member (unless the group consists of only one compound). The efficacy of yield of the alternatives is critical in determining effects of banning any herbicide or group of herbicides. Of all the groups examined, banning triazines would have the greatest net effects after 5 years, a $3.3- to $3.8-billion loss, followed by acetanilides with a $2.1- to $2.7-billion loss. Banning thiocarbamates and dinitroanilines would have much smaller net effects, $740-million and $630-million losses, respectively. However, banning some individual herbicides would have greater welfare effects than banning some groups. For example, banning atrazine would cause net losses of $780 million, less than the triazines of which it is a member but greater than thiocarbamates or dinitroanilines. Among the other individual herbicides examined, banning alachlor would cause a $149-million loss, while banning postemergence herbicides (bentazon, linuron, and 2,4-D) would cause losses from $27 million for linuron to $416 million for bentazon (tables 17-20).

In all scenarios presented, farmers would gain and consumers would lose; the income transfers would be much greater than the net loss. The increases in total crop rent in year 5 would vary from $27 million for banning linuron to $5.4 billion for banning all triazines, if herbicide prices did not increase. Consumer losses would vary from $209 million to $8.9 billion for the same scenarios. If herbicide prices increase, there would be little increase in net effects (losses), but farmers would largely bear the additional cost.

Of all the herbicide groups examined, banning triazines would have the greatest effect on corn variables, followed by acetanilides, thiocarbamates, and dinitroanilines. This ranking coincides with the ranking of corn acreage treated with each class of herbicide. Since dinitroanilines are used on such a small share of the corn acreage, the effects of banning this class would largely be a response to soybean yield and cost changes. Corn prices would increase after 5 years from a minimum of $0.10 per bushel for banning dinitroanilines to a maximum of $0.85 for banning triazines. Banning triazines would cause the maximum corn production decrease, 7 percent. Corn production would decrease less than 1 percent if dinitroanilines were banned. Returns to corn would increase an average of $40 per acre if triazines were banned, $30 if acetanilides were banned, $19 if thiocarbamates were banned, and $9 if dinitroanilines were banned.

Among the individual herbicides, banning atrazine would affect corn most, followed by 2,4-D, bentazon, alachlor, and linuron. This ordering does not coincide with the order of corn acreage treated. Very little bentazon and linuron are applied to corn, while less corn acreage is treated with 2,4-D than alachlor. Effects of banning alachlor would be less than banning 2,4-D because alternatives to 2,4-D are less effective. Banning bentazon would cause a relatively large soybean yield loss and a large corn price response. Banning linuron would not significantly affect corn. The increase in corn prices would vary from $0.20 per bushel for banning atrazine to $0.03 for banning alachlor. Banning atrazine would cause corn production to decrease 2 percent while banning alachlor would cause a negligible decrease in production. Banning atrazine, 2,4-D, or bentazon would increase corn returns about $8 per acre, while banning alachlor would increase returns by less than $2.00.

For soybeans, banning acetanilides would have the greatest effect of all the herbicide groups, followed by dinitroanilines, triazines, and thiocarbamates. Banning all acetanilides would increase soybean prices by $1.40 to $1.50 per bushel (depending upon whether herbicide prices are assumed to increase), decrease production by 2 to 3 percent, and increase returns by $30 per acre. Banning dinitroanilines or all triazines would similarly affect soybeans: prices would increase by $1.00 to $1.20 per bushel, production would decrease by 2 percent, and returns would increase by about $25 per acre. Since thiocarbamates are used very little on soybeans, the effects to soybeans are a response to corn yield and cost changes. Prices would increase by about $0.30 per bushel and returns by $8.00 per acre, while production would decrease by less than 1 percent.

Of the individual herbicides examined, banning bentazon would have the greatest effect on soybeans, comparable with banning dinitroanilines or triazines: prices would increase more than $1.00 per bushel, production would decrease by 2 percent, and returns would increase by about $24 per acre. Following bentazon in descending magnitude are bans on metribuzin, atrazine, 2,4-D, linuron, and alachlor. In all

these scenarios, soybean prices would increase less than $0.35 per bushel, production would decrease less than 0.5 percent, and returns would increase less than $8 per acre. Neither atrazine nor 2,4-D are used on soybeans, so the soybean effects would be in response to changes in corn yields and costs. Alachlor and metribuzin are much more widely used on soybeans than is bentazon, so the large effects of banning bentazon would be due to relatively poor performance of its alternatives.

Conclusion

Results of the scenarios imply that society will bear a cost if any of the corn or soybean pesticides examined were removed from the market because of reduced production efficiency resulting from lower yields or higher production costs. Consumers, some farmers, and industries between the farm gate and consumers will ultimately bear the costs of such regulations.

Table 17 — Economic effects of removing acetanilide herbicides from the market

Effects	Scenario		
	H1	H2	H3
Welfare effects:	*Million dollars*		
Total crop rent —			
Year 1	63.6	3,458.5	2,950.1
Year 5	186.2	4,935.0	4,622.2
Consumers' surplus —			
Year 1	−167.6	−5,072.3	−5,101.9
Year 5	−335.0	−7,059.6	−7,270.3
Net effect —			
Year 1	−124.0	−1,613.8	−2,151.8
Year 5	−148.8	−2,124.6	−2,648.1
Price change:	*Dollars per bushel*		
Corn —			
Year 1	.03	.48	.48
Year 5	.03	.57	.59
Soybeans —			
Year 1	−.01	1.23	1.23
Year 5	.05	1.39	1.47
Acreage change:	*Million acres*		
Corn —			
Year 2	.07	.49	.44
Year 5	.06	.98	.88
Soybeans —			
Year 2	−.09	.92	.70
Year 5	.02	.91	.82
Production change:	*Percent*		
Corn —			
Year 1	−.3	−5.7	−5.7
Year 5	−.2	−4.3	−4.4
Soybeans —			
Year 1	*	−3.2	−3.2
Year 5	*	−2.0	−3.0
Change in returns:	*Dollars per acre*		
Corn —			
Year 1	.67	24.17	20.68
Year 5	1.38	34.13	31.83
Soybeans —			
Year 1	−.34	25.23	20.48
Year 5	.86	30.59	28.04

*Decrease of less than 0.01 percent

Table 18 — Economic effects of removing triazine herbicides from the market

Effects	Scenario		
	H4	H5	H6
Welfare effects:	*Million dollars*		
Total crop rent —			
Year 1	459.9	749.0	2,909.4
Year 5	1,126.5	894.3	5,411.1
Consumers' surplus —			
Year 1	−1,067.7	−904.5	−5,488.7
Year 5	−1,906.4	−855.4	−8,761.2
Net effect —			
Year 1	−607.8	−155.5	−2,579.2
Year 5	−779.9	161.1	−3,350.1
Price change:	*Dollars per bushel*		
Corn —			
Year 1	.10	.01	.80
Year 5	.19	.04	.85
Soybeans —			
Year 1	.01	.54	.58
Year 5	.20	.34	1.04
Acreage change:	*Million acres*		
Corn —			
Year 2	.20	−.34	.77
Year 5	.31	−.12	1.35
Soybeans —			
Year 2	−.10	.68	−.07
Year 5	.10	.52	.13
Production change:	*Percent*		
Corn —			
Year 1	−2.0	0	−8.5
Year 5	−1.5	−.2	−6.5
Soybeans —			
Year 1	0	−1.4	−1.4
Year 5	−.3	−.5	−1.5
Change in returns:	*Dollars per acre*		
Corn —			
Year 1	4.43	1.31	23.06
Year 5	8.38	2.85	40.01
Soybeans —			
Year 1	.36	11.82	12.91
Year 5	4.84	7.73	24.88

Of all the scenarios examined, banning triazines, acetanilides, all soil insecticides, or all seed treatments would generate the largest price and welfare effects. Banning all foliar insecticides, thiocarbamates, dinitroanilines, atrazine, or bentazon would cause relatively moderate aggregate effects compared with the other scenarios examined. Among the pest groups, banning all nematicides or foliar fungicides would have relatively small aggregate effects. Except for atrazine and bentazon, banning any of the individual compounds (or a few insecticides) examined would have only minor aggregate effects. However, individual growers could suffer substantial losses in yield and income.

Banning all pesticides used to control a certain pest would have greater aggregate effects than would banning one or a few pesticides used to control that pest (unless these are the only alternatives). Banning an entire herbicide group would have greater effects than would banning one member of that group. However, banning some individual compounds could have greater effects than would banning some herbicide groups or all compounds used for some pest problems. For example, banning atrazine would have smaller effects than would banning all triazines, but a greater effect than would banning all thiocarbamates, dinitroanilines, foliar insecticides, nematicides, or any other herbicide examined. Also, banning bentazon or 2,4-D

Table 19 — Economic effects of removing triazine, thiocarbamate, and dinitroaniline herbicides from the market

Effects	Scenario		
	H7	H8	H9
	Million dollars		
Welfare effects:			
Total crop rent —			
Year 1	2,496.5	1,276.7	2,148.5
Year 5	5,137.2	2,150.1	2,246.8
Consumers' surplus —			
Year 1	−5,458.3	−1,787.1	−3,011.9
Year 5	−8,922.8	−2,890.2	−2,880.8
Net effect —			
Year 1	−2,961.9	−510.4	−650.0
Year 5	−3,785.6	−740.1	−633.9
	Dollars per bushel		
Price change:			
Corn —			
Year 1	.69	.25	.05
Year 5	.86	.27	.10
Soybeans —			
Year 1	.58	.02	1.83
Year 5	1.16	.32	1.22
	Million acres		
Acreage change:			
Corn —			
Year 2	.77	.75	−.96
Year 5	1.31	.78	−.35
Soybeans —			
Year 2	−.30	−.46	2.40
Year 5	.05	−.85	1.91
	Percent		
Production change:			
Corn —			
Year 1	−8.5	−3.2	0
Year 5	−6.6	−2.1	−.6
Soybeans —			
Year 1	−1.4	0	−4.9
Year 5	−1.6	−.4	−1.7
	Dollars per acre		
Change in returns:			
Corn —			
Year 1	20.99	15.00	4.42
Year 5	38.51	18.48	8.57
Soybeans —			
Year 1	8.17	.41	36.83
Year 5	22.02	8.01	25.49

Table 20 — Economic effects of removing postemergence herbicides from the market

Effects	Scenario		
	H10	H11	H12
	Million dollars		
Welfare effects:			
Total crop rent —			
Year 1	3,331.1	198.5	363.8
Year 5	2,095.6	182.7	944.0
Consumers' surplus —			
Year 1	−2,783.0	−211.7	−884.2
Year 5	−2,510.7	−209.2	−384.6
Net effect —			
Year 1	−451.9	−23.2	−290.4
Year 5	−415.7	−26.5	−384.6
	Dollars per bushel		
Price change:			
Corn —			
Year 1	.05	<.01	.12
Year 5	.09	.01	.13
Soybeans —			
Year 1	1.09	.12	.01
Year 5	1.05	.08	.12
	Million acres		
Acreage change:			
Corn —			
Year 2	−.94	−.09	.28
Year 5	−.36	−.03	.31
Soybeans —			
Year 2	2.52	.17	−.17
Year 5	1.81	.12	−.06
	Percent		
Production change:			
Corn —			
Year 1	0	0	−1.3
Year 5	−.6	*	−1.6
Soybeans —			
Year 1	−4.9	−.3	0
Year 5	−5.7		−.2
	Dollars per acre		
Change in returns:			
Corn —			
Year 1	4.07	.30	6.52
Year 5	7.68	.77	8.24
Soybeans —			
Year 1	35.78	3.01	.20
Year 5	24.20	2.00	3.11

*Decrease of less than 0.1 percent.

would have greater effects than would banning all nematicides or foliar fungicides.

In all scenarios, the prices of corn and soybeans increased while production decreased, regardless of whether one or both crops were directly affected by the regulation to remove the pesticide from the market. The market moderates the decreases in the production of crops directly affected by the regulations by encouraging farmers to plant more acreage to those crops in response to higher prices. As a result, the prices, production, and acreage of other crops would also be affected. While sorghum, wheat, and cotton were not discussed, the prices and returns to those crops generally increase in response to removing corn or soybean pesticides from the market.

As a result of the price increases, farmers gained financially in most scenarios, while consumers always suffered a financial loss. Consumers not only bore the brunt of the cost of the regulation, but the higher prices they paid increased farm income. The returns to crops treated with regulated pesticides almost always increased more than the returns to other crops. However, farmers suffering increased crop losses due to the removal of a pesticide may suffer a financial loss even though farmers as a whole gained.

The only scenario under which corn and soybean growers suffered financial losses was the banning of terbufos and isofenfos, assuming a 25-percent cost increase for alternative pesticides (scenario I2). The bans on alachlor and captan (scenarios H1, F1, F2) produced the only other cases where average soybean returns decreased and then only for 1 year. Note that the set of scenarios examined was not exhaustive, so regulations on other pesticides could cause financial losses for corn and soybean farmers. Scenarios which cause financial losses to corn and soybean farmers assumed very small average yield losses and increases in production costs. However, the income to corn and soybeans, as well as all crops, increased in situations where large yield losses and cost increases occurred. In such cases, the revenue increases resulting from price increases under inelastic demands for alternative crops outweighed the cost increases, causing profits to increase.

The exclusion of farm programs from TECHSIM may result in overestimates of increases in farm prices after removing pesticides from the market. Releases from the large corn inventories could dampen price increases, so the income transfer from consumers to producers and the farm income-enhancing aspects of removing pesticides from the market could be overestimated.

The general trends of this report agree with those of Burton and of Taylor and Frohberg: a net social loss would occur such that producers gain and consumers lose. This report's finding that aggregate effects would be relatively small if individual compounds are withdrawn but much greater if entire herbicide groups or all alternatives for a pest problem are withdrawn also agrees with Burton's findings. (Taylor and Frohberg did not examine comparable scenarios.) However, Burton generally found herbicide regulations to have smaller effects on prices and production. A comparison of costs and yield losses does not seem to explain this discrepancy. While there were disagreements between regions, no general trend developed in the cost- and yield-change assumptions to explain why this report predicts somewhat greater effects than Burton's study. The models would likely be a source of differences. Burton's model covered a much larger portion of the agricultural economy, including livestock markets and the availability of labor, and therefore might have allowed for more input and final product substitution than TECHSIM, causing effects to be lower. In addition, demands might be more inelastic in TECHSIM, resulting in greater price and production changes than predicted by Burton's model.

Implications

With several exceptions, the results show that banning any single corn or soybean pesticide will have only minor aggregate economic effects. However, banning several alternatives used for a pest problem can result in very large impacts. Therefore, this report shows the interdependence among regulatory decisions. Canceling a pesticide reduces the alternatives available to combat a particular pest problem, and thus the number of alternatives available in the event of any future cancellation. The outcome of a pesticide regulatory decision will influence the effects of future regulatory decisions.

The acetanilides illustrate the interdependence among decisions. The results show the net effect of banning alachlor, assuming metolachlor is available, to be about a $149-million loss (table 17). Banning metolachlor, assuming alachlor is available, would not be greater than a $149-million net loss. The experts in every region claimed that alachlor was equal to or slightly superior to metolachlor in controlling weeds. In addition, metolachlor is somewhat more expensive than alachlor. However, banning both acetanilides would have a net effect of a $2.12-billion loss. Banning metolachlor, assuming alachlor has already been banned, would cause a net loss of $1.98 billion. There would be similar effects to other welfare indicators, prices, and production. Thus, a decision to remove

alachlor from the market would substantially affect the outcome of banning metolachlor later. If a decision were made to remove metolachlor first, it would substantially affect the economic results of a decision to ban alachlor.

The calculated safety, health risks, or environmental hazards that chemicals pose are also interdependent. This interdependence occurs because risk measures depend on the intensity of health problems that a chemical causes (for example, acute toxicity, carcinogenicity, or teratogenicity) as well as probable exposure. Thus, an acutely toxic chemical that currently shows only minor use could be judged as not very hazardous or risky. Another chemical with much more extensive use, and hence higher exposure to users and the general population, could be considered far more dangerous to the environment even if the intensity of its health risks were less. Removing the allegedly hazardous chemical from the market could induce farmers to use a chemical that was formerly out of favor. Use of an acutely toxic material could balloon. A regulation could replace exposure to one chemical with exposure to a far more toxic substance. The risks that a chemical poses depends on previous regulations because regulations will influence use. To precisely estimate both the benefits and risks of continued chemical use, one must forecast changes in use. The *Pesticide Assessment of Field Corn and Soybeans* shows that these changes could be significant (*10-15*).

This interdependence among regulatory decisions reveals a weakness in the pesticide-by-pesticide approach traditionally used in pesticide regulatory analyses and decisionmaking. In addition, EPA has not randomly selected pesticides for review. Insecticides were selected for review in the early and mid-seventies. The order in which they were reviewed appeared to follow use patterns, with the most heavily used compounds examined first. Reviews of the major fungicides followed in the late seventies. Some herbicides and fumigants are currently under examination.

Such an approach may reduce the number of alternatives available to control a crop pest over time, resulting in substantial effects from future regulatory decisions. Decisions on pesticides that are substitutable in farm production have been, and continue to be, closely sequenced. The benefits derived from continued use of a given chemical may vary radically, depending on prior decisions in the sequence. A major problem emerges if a pesticide examined late in the sequence turns out to have higher health, safety, or environmental risks than did the pesticides previously examined. The economic effects of banning such a pesticide would be much greater than if it were banned earlier in the sequence. Given the new risk and benefit information, a decision to ban the pesticide under current consideration and keep one or more previously banned pesticides on the market might result in lower exposure risk and economic loss. Determining the sequence in which pesticides are to be examined could substantially influence the risks and economic effects ultimately borne by society.

This problem is compounded if several materials used for the same pest problem are reviewed in a very short time. Examining each material independently ignores the fact that each material is an alternative for the others. A decision to remove one or more from the market would invalidate all other analyses which did not account for the potential decision.

It is important to structure the pesticide regulatory process to consider the interdependence of regulatory decisions in a cost-effective manner. The *Pesticide Assessment of Field Corn and Soybeans* shows that an approach using expert estimates of cost and yield changes can be structured to show the economic implications of such interdependence (*10-15*). Such an approach could be used in at least two ways. First, estimates of crop yield and production cost changes for acreage without chemical pest controls will show the "worst case" loss of benefits. Such a situation could help target groups of chemicals for a more intensive and systematic assessment of risks and benefits. Second, the approach could be used to assess the economic implications of a variety of regulatory options. Such an approach could assess the risks and benefits of the same options. The *Pesticide Assessment of Field Corn and Soybeans* should be a guide for developing such an approach and should also indicate pitfalls to avoid (*10-15*).

If a pesticide-by-pesticide approach is to be retained, the sequence of decisions becomes critical if the interdependency problem is to be minimized. If a quick, inexpensive method for ranking relative risk were available, then one should draft a preliminary ranking of the relative safety and environmental risks of each chemical in the group to be assessed, beginning with the chemical of highest relative risk and descending in order of risk. Such sequencing of decisions would reduce the probability that a highly risky chemical would be one of the later chemicals examined after less risky alternatives were removed from the market. Preliminary estimates of economic losses without chemical groups or all chemicals used for a target pest would make the procedure more efficient. Efforts to determine the sequence of decisions by relative risk would focus on those chemicals where regulatory decisions could cause the greatest economic losses.

References

(1) Agmarket Research, Inc. "Agchemprice: Current Prices of Non-Fertilizer Agricultural Chemicals." Vol. 4, No. 9 (Sept. 1984). Unpublished computer printouts.

(2) Burton, Robert O. "Reduced Herbicide Availability: An Analysis of the Economic Impacts on U.S. Agriculture." Ph.D. dissertation. Purdue Univ., 1982.

(3) Chavas, Jean-Paul, and Glenn S. Collins. "Welfare Measures from Technological Distortions in General Equilibrium," *Southern Economic Journal*, Vol. 48, No. 1 (Jan. 1982). pp. 745-53.

(4) Collins, Glenn S., and C. R. Taylor. "TECHSIM-A Regional Field Crop and National Livestock Econometric Simulation Model," *Agricultural Economics Research*, Vol. 35, No. 2 (Apr. 1983). pp. 1-8.

(5) Delvo, Herman W. *Economic Impact of Discontinuing Aldrin Use in Corn Production*. ERS-557. U.S. Dept. Agr., Econ. Res. Serv., June 1974.

(6) Duffy, Michael, and Michael Hanthorn. *Returns to Corn and Soybean Tillage Practices*. AER-508. U.S. Dept. Agr., Econ. Res. Serv., Jan. 1984.

(7) Hanthorn, Michael, Craig Osteen, Robert McDowell, and Larry Roberson. "1980 Pesticide Use on Field Corn in the Major Producing States." ERS Staff Report No. AGES820202. U.S. Dept. Agr., Econ. Res. Serv., Feb. 1982.

(8) _____. "1980 Pesticide Use on Soybeans in the Major Producing States." ERS Staff Report No. AGES820106. U.S. Dept. Agr., Econ. Res. Serv., Jan. 1982.

(9) Just, Richard E., and Darrell L. Hueth. "Welfare Measures in a Multimarket Framework," *American Economic Review*, Vol. 79, No. 5 (Dec. 1979). pp. 947-54.

(10) The National Agricultural Pesticide Impact Assessment Program. "Pesticide Assessment of Field Corn and Soybeans: Corn Belt States." ERS Staff Report No. AGES850524A. U.S. Dept. Agr., Econ. Res. Serv., Dec. 1985.

(11) _____. "Pesticide Assessment of Field Corn and Soybeans: Delta States." ERS Staff Report No. AGES850524B. U.S. Dept. Agr., Econ. Res. Serv., Dec. 1985.

(12) _____. "Pesticide Assessment of Field Corn and Soybeans: Lake States." ERS Staff Report No. AGES850524C. U.S. Dept. Agr., Econ. Res. Serv., Dec. 1985.

(13) _____. "Pesticide Assessment of Field Corn and Soybeans: Northeastern States." ERS Staff Report No. AGES850524D. U.S. Dept. Agr., Econ. Res. Serv., Dec. 1985.

(14) _____. "Pesticide Assessment of Field Corn and Soybeans: Northern Plains States." ERS Staff Report No. AGES850524E. U.S. Dept. Agr., Econ. Res. Serv., Dec. 1985.

(15) _____. "Pesticide Assessment of Field Corn and Soybeans: Southeastern States." ERS Staff Report No. AGES850524F. U.S. Dept. Agr., Econ. Res. Serv., Dec. 1985.

(16) Osteen, Craig, and Fred Kuchler. "Corn and Soybean Production Losses from Potential Regulatory Actions," *Inputs Outlook and Situation Report*. IOS-6. U.S. Dept. Agr., Econ. Res. Serv., Nov. 1984, pp. 14-21.

(17) Settle, Russell F. "Evaluating the Economic Benefits of Pesticide Usage," *Agriculture, Ecosystems, and Environment*, Vol. 9 (1983). pp. 173-85.

(18) Taylor, C. Robert, and Klause K. Frohberg. "The Welfare Effects of Erosion Controls, Banning Pesticides, and Limiting Fertilizer Applications in the Corn Belt," *American Journal of Agricultural Economics*, Vol. 59, No. 1 (Feb. 1977). pp. 25-36.

(19) U.S. Department of Agriculture, Economic Research Service. *Inputs Outlook and Situation*. IOS-2. Oct. 1983. pp. 4-13.

(20) U.S. Department of Agriculture, State Land Grant Universities, and U.S. Environmental Protection Agency. "Biological Report and Economic Analysis of Trifluralin." Unpublished working paper. Aug. 1978.

(21) U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances. *Suspended, Cancelled, and Restricted Pesticides*. Third Revision. Jan. 1985.

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ECONOMIC IMPLICATIONS OF ALTERNATIVE METHODS OF CERTIFICATING DOCKAGE IN U.S. WHEAT: AN EXECUTIVE SUMMARY

by

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ABSTRACT

The current procedure used in certificating the dockage content of U.S. wheat on official grade certificates disregards up to 0.49 of a percentage point of dockage present in each sample inspected. In an effort to achieve a more complete disclosure of the actual dockage content on official grade certificates, the Federal Grain Inspection Service (FGIS) proposed a change in the dockage rounding procedure in 1984. The proposal would involve rounding to the nearest one-half of a percentage point. Recently, the FGIS industry advisory committee recommended rounding the dockage content to the nearest tenth of a percentage point when recording on the official grade certificate. This paper summarizes the findings and conclusions of an ERS study of the implications of adopting one of these proposed methods. The economic impact of adopting one of the proposed methods would be small, and there are several potential benefits if adoption results in an overall reduction in the average dockage content of U.S. wheat.

KEY WORDS: FGIS, dockage, wheat grading, grading standards, wheat marketing

NOTES

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INTRODUCTION

Grading standards for wheat were established under the United States Grain Standards Act of 1916. The primary goal of the standards is to set up and maintain an impartial quality identification system to facilitate the merchandising of grain in interstate and foreign commerce. The grading standards for wheat requires that inspectors measure the dockage content of each sample and record that result on the official grade certificate when required.

Dockage content does not affect the numeric grade assigned to a wheat lot; however, it provides buyers with an estimate of the amount of non-millable material that would be removed when the wheat is cleaned prior to milling. Normal trade practices provide for an adjustment in the weight of a lot based on the certificated dockage content. Market price quotations are offers and bids for "dockage free" wheat which may contain as much as 0.49 of a percentage point of undisclosed dockage under current certification procedures.

The current procedure for certificating dockage (hereinafter referred to as Method A) raises questions related to fairness and accuracy in the minds of many buyers. As a result, proposals to revise the procedure are made from time to time. The purpose of this paper is to summarize the findings and conclusions of a recent study that focused on the economic implications of alternative methods of certificating dockage (4) 1/. That study is undergoing review and edit for publication under separate cover.

ALTERNATIVE METHODS OF CERTIFICATION

The current procedure, which was adopted in 1964, does not require that the dockage content be recorded on the official grade certificate when the amount is 0.49 of a

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1/Underscored numbers in parentheses refer to publications listed in the reference section.

percentage point or less. When the dockage content is equal to 0.5 of a percentage point or more, it is stated in terms of half percent, whole percent, or whole and half percent, as the case may be (See Method A, in table 1). Certificated dockage under this procedure is almost always less than the actual dockage content, and each lot can contain up to 0.49 of a percentage point of undisclosed dockage.

In 1984, the Federal Grain Inspection Service (FGIS) proposed a procedure whereby the unrecorded allowance would be reduced to one-fourth of a percentage point, and higher levels would be stated at 0.5 percent increments (See Method B in table 1). The proposal was withdrawn pending further study of the issue (11). Adoption of this procedure would have reduced the undisclosed dockage by 50 percent or more. Consequently, certificated dockage would have been a more accurate statement of the actual dockage content of a wheat lot.

Subsequent discussions of the subject have focused on other options open to FGIS. In 1985, the FGIS Advisory Committee recommended that FGIS consider certificating dockage content in 0.1 of a percentage point increments (See Method C in table 1). Adoption of this alternative would totally eliminate the problem of undisclosed dockage.

The practical and economic implications of adopting one of the proposed methods are summarized in the sections that follow. The economic analysis will focus on the domestic and export components of the demand for U.S. wheat as well as carryover stocks.

THE DOCKAGE CONTENT OF U.S. WHEAT

An evaluation of the economic implications of alternative methods of certificating dockage in U.S. wheat requires information on the actual dockage content of U.S. wheat as well as estimates of the amount of undisclosed dockage under the alternative methods of certification. Data on the actual dockage content of wheat moving in U.S. marketing channels were collected by FGIS and furnished to ERS for use in the study. These data were collected from two points in the marketing channel: (1) inbound-truck and submitted-sample inspections at interior markets; and (2) official, shiplot inspections of wheat loaded for export at various ports.

Dockage at Interior Inspection Points

Official inspection agencies in 17 states measured and reported the wheat dockage content of inbound-truck and submitted-sample inspections during the period of heavy deliveries following harvest in 1984. The data base contained the measured dockage content of 60,760 samples. The number of samples inspected for each class of wheat is shown in table 2.

Table 1. A comparison of actual and certificated dockage using alternative methods of certification

Certification procedure	Range of actual dockage	Certificated dockage
Method A 1/	0.00% to 0.49%	not stated
	0.50% to 0.99%	0.5%
	1.00% to 1.49%	1.0%
	1.50% to 1.99%	1.5%
	etc.	etc.
Method B 2/	0.00% to 0.25%	not stated
	0.26% to 0.75%	0.5%
	0.76% to 1.25%	1.0%
	1.26% to 1.75%	1.5%
	etc.	etc.
Method C 3/	0.00% to 0.05%	not stated
	0.06% to 0.15%	0.1%
	0.16% to 0.25%	0.2%
	. . .	.
	. . .	.
	. . .	.
	0.96% to 1.05%	1.0%
	etc.	etc.

1/ Procedure adopted in 1964.
2/ Procedure proposed in 1984.
3/ Procedure recommended by the FGIS Advisory Committee in 1985.

The dockage content of each sample was reported in hundredths of a percentage point. The overall mean dockage content of all samples was 0.97 percent, and the average for individual classes ranged from a low of 0.92 percent for soft red winter (SRW) to a high of 1.07 percent for durum (DUR) (table 2). Since the samples were either submitted by elevators or collected from inbound truck receipts at the point of first inspection, the results should be representative of the wheat entering the marketing channel in 1984 before extensive mixing and blending was performed.

The dockage content of each sample was "certificated" according to the rounding methods currently used (Method A) or being considered by FGIS (Methods B and C). The average amount of certificated dockage under each procedure was then computed for each class and those results are also presented in Table 2. Overall, the amount of certificated dockage under Method A understated the true dockage content by 0.25 of a percentage point on average. The average amounts certificated under Methods B and C were accurate reflections of the true means. These results indicate that either of the proposed methods would more accurately or more fully disclose the true dockage content on average and would be more equitable for all parties involved in buying and selling wheat. Buyer uncertainty concerning the true dockage content of the wheat represented by a grade certificate would be greatly reduced under Method B and would be eliminated under Method C.

Adoption of Method B would alter the distribution of samples among the various dockage-certification levels. For example, samples with dockage contents of 0.26 to 0.49 percent would be certificated at 0.5 percent rather than not stated. The distribution of samples by level of certificated dockage using Methods A and B are compared in table 3. Since a majority of the samples in which dockage would not be stated under the current standards have a measured dockage in excess of 0.25 of a percentage point, there would be a substantial decline in the proportion of samples certified as having no dockage under Method B. This decline would be offset by smaller increases in the proportion certificated at other levels. Overall, 50 percent of the samples would be certificated at the 0.5-percent level if Method B were adopted and used to round the dockage content for purposes of recording on the grade certificate.

The distributions of samples inspected at interior points with dockage content certificated to tenths of a percentage point (Method C) are shown by class of wheat in table 4. The medians of these distributions ranged from 0.6 percent for SRW to 0.9 percent for DUR. The distributions were more peaked for the classes HRW, SRW, and WHI with modes of 0.4-0.5 percent. Samples representing the classes DUR and HRS generally contained more dockage overall; however, all classes

Table 3. A comparison of the distribution of interior wheat inspections by level of certificated dockage using Methods A and B and by class of wheat, 1984

Certificated dockage content	Dockage certification procedure			
	Method A	Method B	Method A	Method B
	Percent			
	Durum		Hard Red Spring	
not stated	19.5	3.7	28.0	8.4
0.5%	37.3	36.5	38.8	41.7
1.0%	23.4	30.7	18.0	28.0
1.5%	10.9	16.1	6.8	11.2
2.0%	4.2	6.4	3.3	4.2
2.5%	2.4	3.2	1.8	2.5
3.0%	.8	1.6	1.1	1.3
3.5%	.4	.6	.7	.8
4.0% or more	1.1	1.2	1.5	1.9
	Hard Red Winter		Soft Red Winter	
not stated	30.6	5.9	36.5	8.6
0.5%	45.5	53.8	36.5	51.8
1.0%	12.4	24.9	13.6	20.5
1.5%	3.9	6.4	5.9	9.6
2.0%	1.9	2.6	2.7	3.8
2.5%	1.1	1.5	1.7	2.1
3.0%	1.0	1.0	.8	1.2
3.5%	.8	.9	.4	.5
4.0% or more	2.8	3.0	1.9	1.9
	White		All classes	
not stated	33.1	6.8	31.2	6.7
0.5%	37.5	50.0	41.4	50.4
1.0%	15.0	23.3	14.3	24.7
1.5%	5.5	8.8	5.2	8.3
2.0%	3.0	4.0	2.5	3.4
2.5%	1.6	2.2	1.4	1.9
3.0%	1.0	1.1	1.0	1.2
3.5%	.7	.8	.7	.8
4.0% or more	2.6	3.0	2.3	2.6

Table 2. A comparison of mean actual inbound truck dockage and average amount of certified dockage under current and proposed methods of certification, by class of wheat, United States, 1984 1/

Class of wheat	Samples in the analysis	Mean dockage content	Mean certificated dockage 2/			Net differences	
			Method A	Method B	Method C	B-A	C-A
	Number	Percent	Percent			Percent	
Durum	2,025	1.07	0.83	1.07	1.08	0.24	0.25
Hard Red Spring	8,793	.98	.73	.98	.98	.25	.25
Hard Red Winter	29,346	.96	.71	.96	.97	.25	.26
Soft Red Winter	7,831	.92	.67	.93	.93	.26	.26
White	12,765	.99	.73	.99	.99	.26	.26
All classes	60,760	.97	.72	.97	.97	.25	.26

1/ Percentage dockage in all classes is a weighted average using the number of samples inspected for each class as a weighting factor.

2/ The dockage content of each sample was "certificated" according to the three methods illustrated in table 1 before the means for each class of wheat were computed.

Table 4. Distribution of interior inspections with dockage content rounded to tenths (Method C), by class of wheat, major inspection points, 1984

Certificated dockage content	Class of Wheat				
	DUR	HRS	HRW	SRW	WHI
			Percent		
0.0%	0.1	0.1	---	0.2	---
.1%	.9	3.1	1.3	1.6	1.3
.2%	2.5	5.2	4.0	6.8	5.0
.3%	4.1	7.0	7.9	10.1	9.5
.4%	8.1	8.1	10.9	11.7	11.3
.5%	8.2	8.8	12.4	11.6	11.8
.6%	8.6	8.8	11.9	9.4*	9.3
.7%	7.4	8.1	10.3*	8.2	8.0*
.8%	7.3	7.5*	8.3	6.2	7.0
.9%	7.3*	7.4	6.5	5.1	5.2
1.0%	6.1	4.8	4.8	3.9	4.6
1.1%	5.1	4.7	3.4	2.8	3.9
1.2%	4.9	4.1	2.8	2.8	3.2
1.3%	4.1	3.3	2.1	2.6	2.7
1.4%	4.1	2.7	1.5	2.4	2.0
1.5%	2.9	2.2	1.2	2.0	1.9
1.6%	3.1	1.9	1.0	1.7	1.3
1.7%	2.1	1.4	.8	1.1	1.1
1.8%	2.1	1.2	.7	.9	1.1
1.9%	1.7	.8	.6	1.0	.8
2.0%	1.0	.8	.5	.8	.8
2.1%	.9	.8	.4	.6	.6
2.2%	.8	.7	.4	.6	.7
2.3%	.7	.5	.4	.4	.5
2.4%	.9	.8	.4	.4	.6
>2.4%	5.0	5.4	5.5	5.1	6.8

* Median of distribution

had a sizeable number of high-dockage lots. Five percent or more of the samples in each class had a dockage content in excess of 2.4 percent.

The aggregated results for all classes in table 3 indicate that 69 percent of the wheat lots entering the marketing channel in 1984 would require cleaning to avoid a reduction in weight as a result of dockage under the current standards. The proportion needing cleaning in order to avoid a weight reduction during settlement under Method B would increase to 93 percent.

Dockage at Export Inspection Points

Data on the average dockage content of 2,687 official, shiplot inspections of wheat were collected from ship-loading logs by FGIS and made available for the study. The size of the various lots ranged from less than 100 tons to fully loaded bulk vessels containing more than 70,000 tons. Because of this wide range in lot sizes, the quantity of wheat in each lot was used as a weight in computing means and developing frequency distributions.

The mean dockage contents for the wheat classes HRW, SRW, and WHI were substantially lower than the means computed at interior inspection points and shown in table 2. The means for each class at export points are shown in table 5. The fact that the class means are lower suggest that either dockage is being removed through cleaning operations or wheat lots with a lower dockage content are moving into export channels.

In order to compare and contrast the alternative certification methods, the dockage content of each lot was certificated according to the current and proposed procedures, and means for each class and method were computed. Those results are also shown in table 5. Overall, the current standards (Method A) allowed 0.24 of a percentage point of hidden dockage on average or about one-third of the dockage present in the wheat to not be disclosed on official grade certificates. In contrast, Method C yielded means of certificated dockage content that were almost identical to the true means of dockage content. As noted before, Method B is a less precise procedure, and the mean certificated dockage for each class varies somewhat from the true means. If Method B were to be adopted handlers would likely adjust their cleaning and blending practices in a fashion that "under-disclosure" would still exist but it would be reduced by 50 percent or more.

The distributions of export wheat lots by level of certificated dockage under Methods A and B are shown in table 6. The classes DUR and HRS generally contained higher levels of dockage and few lots were certificated as "dockage free"

Table 6. A comparison of the distribution of export wheat inspections by level of certificated dockage using Methods A and B and by class of wheat, 1984

Certificated dockage content	Dockage certification procedure			
	Method A	Method B	Method A	Method B
	Percent			
	Durum		Hard Red Spring	
not stated	.1	.0	3.7	.4
0.5%	37.9	4.1	72.1	21.1
1.0%	60.8	68.3	22.6	74.9
1.5%	1.2	27.4	1.6	3.3
2.0%	.0	.2	.0	.3
	Hard Red Winter		Soft Red Winter	
not stated	15.7	.1	7.5	.1
0.5%	83.9	81.6	87.5	77.8
1.0%	.4	18.1	4.4	20.7
1.5%	.0	.2	.6	1.4
2.0%	.0	.0	.0	.0
	White		All classes	
not stated	36.7	.5	14.8	.2
0.5%	59.9	65.7	77.1	66.3
1.0%	3.2	33.4	7.7	31.2
1.5%	.2	.4	.4	2.2
2.0%	.0	.0	.0	.1

using either Method. Adoption of Method B would substantially reduce the proportion certificated at the 0.5% level. In the case of DUR, this decline is offset by a noticeable increase at the 1.5% level. In contrast, the shift for the class HRS is from the 0.5% level to the 1.0% level. For all other classes, the proportion certificated as "dockage free" declined while the proportion certificated at the 1.0% level increased when Method B was used.

The distribution of export inspections when dockage was "certificated" to the nearest tenth of a percentage point (Method C) is shown by class of wheat in table 7. These distributions reveal why the results under Method B (table 6) were substantially different for different classes. For example, a sizeable proportion of HRS lots had dockage contents of 0.8 and 0.9 percent, but were certificated at the 0.5% level under Method A. All of these lots would move to a higher certification level (1.0%) if Method B were adopted. Adoption of Method C would result in a full disclosure of dockage and would eliminate the existing incentive to blend to the high end of certification increments.

ECONOMIC IMPACT OF ALTERNATIVE CERTIFICATION METHODS

The economic impact of adopting either of the proposed methods of certificating dockage depends upon how market participants view the market price quotations for wheat in relation to the certificated dockage content. Since certificated dockage is deducted from the weight of a wheat lot in the settlement process, the market price quotations are offers and bids for "clean" wheat. Thus, the impact depends upon traders' expectations concerning undisclosed or "hidden" dockage present in "clean" wheat. These expectations vary from one trader to another based on past experiences; therefore, three scenarios of market behavior were hypothesized for the analysis in order to cover the full range of possibilities.

Scenarios of Market Behavior

The three scenarios of market behavior used in the analysis are identified as (1) naive market behavior, (2) average market behavior, and (3) sophisticated market behavior. In a naive market, buyers and sellers are assumed to enter market transactions based on the expectations that the certificated amount of dockage is the maximum amount of dockage in the lot. Trading on the belief that certificated dockage is the maximum present in the lot would result in greater discounts under certification Methods B and C relative to Method A since the certificated dockage content would be higher under those methods (see tables 2 and 5). This scenario is not believed to be typical market behavior in the

Table 7. Distribution of export inspections with dockage content rounded to tenths (Method C), by class of wheat, U.S. ports, 1984

Certificated dockage content	Class of wheat				
	DUR	HRS	HRW	SRW	WHI
	Percent				
0.0%	---	---	---	---	---
.1%	---	.4	.1	.1	---
.2%	---	---	---	---	.4
.3%	---	.1	1.3	.3	3.3
.4%	.1	1.5	3.2	4.3	22.8
.5%	.0	4.2	13.4	12.3	14.4
.6%	.4	6.8	32.5*	26.1	12.6*
.7%	2.8	7.7	30.5	32.4*	11.6
.8%	7.0	16.5	11.2	13.1	17.0
.9%	20.0	28.4*	7.4	6.3	12.1
1.0%	17.4	18.0	.1	1.1	2.6
1.1%	11.3*	8.7	.1	2.1	.8
1.2%	13.2	3.8	.0	.5	2.0
1.3%	14.0	1.4	---	.7	---
1.4%	11.5	.8	.2	.1	.2
1.5%	1.1	.1	---	---	---
1.6%	.9	.9	---	.6	---
1.7%	---	.4	---	.0	---
1.8%	.2	---	---	---	.2
1.9%	.1	.3	---	---	---

*Median of distribution

U.S. wheat industry; however, it was included in the analysis as the "worse-case" scenario.

The average market scenario assumes that buyers enter transactions based on the average amount of undisclosed dockage received in previous transactions. Based on the data in tables 2 and 4, buyers would expect, on average, to receive about one-fourth of a percentage point of undisclosed dockage in each lot purchased. For purposes of analysis, the amount of undisclosed dockage under Method A was assumed to be 0.25 of a percentage point. The amount of undisclosed dockage under Method B was assumed to average 0.1 of a percentage point.

The sophisticated market scenario assumes that market transactions occur based on the expectations that the certificated amount of dockage under the current standards (Method A) understates the true dockage content by 0.44 of a percentage point. Likewise, market transactions under certification Method B would be based on the expectations that certificated dockage understates true dockage by about 0.2 of a percentage point.

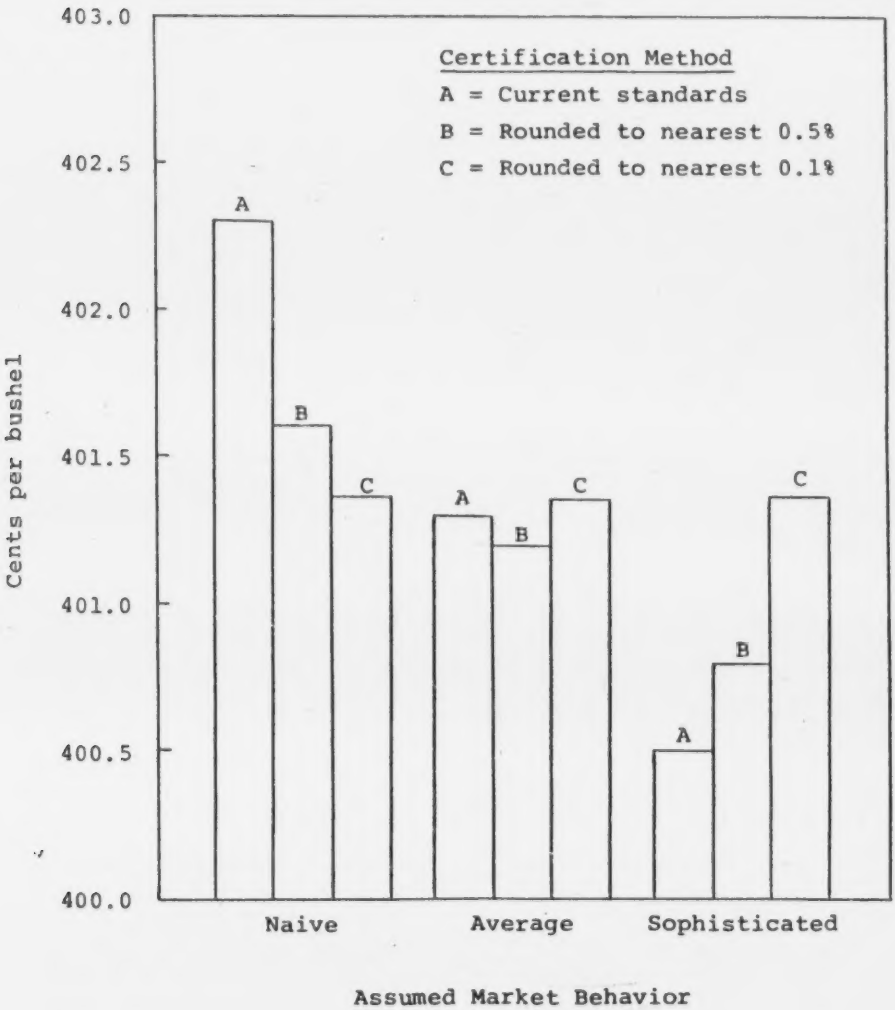
Expectations concerning "hidden" dockage would be eliminated if Method C were adopted for certificating dockage. Consequently, the discounted price for a particular wheat lot would be the same for all market behavior scenarios.

Net Price Differences by Market Scenario

A pricing and discounting procedure was developed so that a unique discounted price for each lot was estimated under each certification method and market-behavior scenario. The base prices used in the procedure were the average prices during the 1984/85 marketing year at terminal and port locations (table 8). The average prices at terminal markets were used in conjunction with samples inspected at interior inspection points to calculate weighted average discounted prices for each class of wheat. The average price for each class of wheat at the various ports was used in conjunction with the dockage data collected at ports in estimating a unique discounted price for each lot under each method of dockage certification and market behavior scenario.

The relationships among average discounted prices, given alternative market behavior scenarios and methods of dockage certification, are illustrated in figure 1. This example is for an average lot of hard red winter at U.S. ports and the base market price was $4.04 per bushel (table 8). The average discounted prices in this case were:

Figure 1. Average discounted prices for hard red winter wheat at U.S. ports under alternative dockage certification procedures and market behavior patterns, 1984/85



Market behavior	Method A	Method B	Method C
		Cents per bushel	
Naive	402.290	401.610	401.362
Average	401.280	401.206	401.362
Sophisticated	400.513	400.802	401.362

Table 8. Average wheat prices at various stages of the marketing system, United States, 1984/85 marketing year

Class of wheat	Received by farmers1/	Terminal market prices2/	Delivered port regions3/
		Dollars per bushel	
Durum	3.70	4.37	4.47
Hard Red Spring	3.54	4.08	4.44
Hard Red Winter	3.34	3.74	4.04
Soft Red Winter	3.33	3.57	3.72
White	3.43	3.82	3.86

1/Average price received by farmers in major producing states.

2/Minneapolis -- durum and hard red spring; Kansas City -- hard red winter; St. Louis -- soft red winter, and Portland -- soft white.

3/Prices are averages for major ports weighted by export shares. DUR and HRS prices are averages of Duluth, Gulf, and Pacific Northwest (PNW), HRW prices are averages of Gulf and PNW; SRW prices are averages of East Coast and Gulf; and WHI is for PNW only.

Source: (9, pp. 28-29, and 7, selected issues).

The average discounted prices were then used to compute net price changes for certification Methods B and C relative to Method A for each market behavior scenario. In the above example, the net per unit price changes are:

Market behavior	Method B	Method C
	Cents per bushel	
Naive	-0.680	-0.928
Average	-0.074	+0.082
Sophisticated	+0.289	+0.849

Although the study focused on price changes and impacts for individual classes of wheat, only the overall weighted averages will be presented in this paper. The weighted average price changes at various stages of the marketing channel under each market behavior scenario are presented in table 9. It should be remembered that the naive market represents the "worse-case" scenario, and the impact never exceeds 1 cent per bushel regardless of the location or certification option. Under the average market scenario, the impact of adopting one of the proposed certification method B was estimated to be less than 0.4 of a cent per bushel in all cases, and the impact of adopting Method C was very small.

Under the sophisticated market scenario the impact of adopting Method B would be small in all cases. Under this market behavior, adoption of Method C for certificating dockage would enhance market values by about 0.7 of a cent per bushel which would offset the additional weight reductions resulting from higher levels of certificated dockage. Wheat traders in the United States are believed to have rather sophisticated expectations regarding undisclosed dockage; therefore, these results would strongly support the adoption of certification Method C since undisclosed dockage would be eliminated.

Estimates of the per unit price changes for each class at the terminal and port levels were used in conjunction with data on domestic use, exports, and carryover stocks (table 10) to estimate the change in total value. The combined impact at interior markets and export regions plus the impact on the value of stocks are shown in table 9, given alternative market behavior scenarios. In the naive market, adopting Method C would have an overall negative impact of about $39 million.

Table 9. Estimated weighted average per unit and total change in value of wheat resulting from the adoption of dockage certification Methods B and C by market sector and market behavior, 1984/85 marketing years

Market sector and certification method	Market behavior scenario		
	Naive	Average	Sophisticated
	Cents per bushel		
INTERIOR MARKETS			
Method B	-.970	-.385	-.045
Method C	-.971	-.044	+.674
EXPORT REGIONS			
Method B	-.846	-.242	+.120
Method C	-.981	+.025	+.789
INVENTORIES			
Method B	-.968	-.387	-.039
Method C	-.996	-.027	+.709
	Thousands of Dollars		
INTERIOR MARKETS			
Method B	-11,199	-4,444	-520
Method C	-11,214	-505	+7,788
EXPORT REGIONS			
Method B	-11,521	-3,299	+1,638
Method C	-13,360	+337	+10,752
INVENTORIES			
Method B	-13,790	-5,509	-549
Method C	-14,181	-384	+10,100
TOTAL			
Method B	-36,510	-13,252	+569
Method C	-38,755	-552	+28,640

Table 10. Supply and disappearance of wheat by class, United States, 1984/85 marketing year

Item	Class of wheat					All classes
	DUR	HRS	HRW	SRW	WHI	
	Million bushels					
Supply:						
Beg. stocks	99	314	745	74	167	1,399
Production	103	409	1,251	532	300	2,595
Imports1/	5	2	0	0	2	9
Total	207	725	1,996	606	469	4,003
Disappearance						
Domestic use	46	172	562	289	86	1,155
Exports1/	61	183	717	253	210	1,424
Total	107	355	1,279	542	296	2,579
Ending stocks	100	370	717	64	173	1,424

1/Imports and exports include flour and products in wheat equivalents.

Source (8, p. 18)

At the other extreme, adopting Method C in a sophisticated market environment would have a positive impact of about $29 million.

The average market behavior scenario would appear to give the most realistic estimates of the economic impacts of adopting one of the proposed methods. The larger impact resulting from the adoption of Method B should disappear as handlers adjust blending targets. The potential amount of undisclosed dockage assumed for Method B was present only in the export data for HRW and SRW. In fact, the economic impact of adopting Method B was positive at export points for the class SRW since undisclosed dockage was actually greater than the amount assumed under the average market scenario. It should be noted that the inventory impact is a one time occurrence.

These results suggest that the economic impact would be quite variable depending upon the bargaining position of individual buyers and sellers. The total value of a particular crop of wheat is determined from the value of products that can be produced from the wheat and not by the procedure used to certificate dockage. The extent to which individual producers are impacted as a result of adopting one of the proposals will depend upon the competitiveness of the local

Table 5. A comparison of actual dockage in export wheat and amounts of certified dockage under current and proposed methods of certification, by class of wheat, United States, 1984 1/

Class of wheat	Volume inspected	Mean dockage content	Mean certificated dockage 2/			Net differences	
			Method A	Method B	Method C	B-A	C-A
	Mil. bu.		Percent			Percent	
Durum	75.2	1.09	0.82	1.12	1.09	.30	.27
Hard Red Spring	206.0	.88	.61	.91	.89	.30	.28
Hard Red Winter	740.4	.65	.42	.59	.65	.17	.23
Soft Red Winter	225.0	.68	.49	.62	.68	.13	.19
White	209.0	.64	.33	.67	.64	.34	.31
All classes	1,455.6	.71	.47	.68	.71	.21	.24

1/ Percentage dockage in all classes is a weighted average using the volume inspected for export for each class as a weighting factor.

2/ The dockage content of each sample was "certificated" according to the three methods illustrated in table 1 before the means for each class of wheat were computed.

market where the producer delivers wheat. The economic well-being of producers who deliver clean wheat to market should not be adversely affected. In contrast, producers who routinely deliver wheat with a high dockage content would be discounted accordingly.

In addition to direct price impacts that would result, there are several issues and implications related to the proposals that are difficult to quantify economically that have a bearing on the final decision regarding the adoption of an alternative dockage certification procedure. These implications are addressed in the next section.

OTHER IMPLICATIONS OF THE PROPOSALS

Other issues that relate to the decision concerning dockage certification procedures used in the United States are difficult to quantify economically for the industry as a whole. Inventory management and merchandising practices as well as cleaning and blending capabilities vary substantially from one firm to another and from one location to another. Likewise, the level of dockage and the potential problems that dockage can cause appears to vary greatly from one location to another and among the classes of wheat. With this in mind, some of the major issues will be addressed in this section to determine what conclusions if any can be reached, given the data limitations that exist.

Improved Pricing Efficiency

Adoption of Method C would eliminate the uncertainty with regard to undisclosed dockage. There is little doubt that grade certificates which accurately describe the grain being traded would result in a more efficient price discovery process. There is uncertainty about the amount of undisclosed dockage present in wheat graded under current standards. As a result, the relative value of wheat lots that are identical except for certificated dockage content can be distorted.

To illustrate how undisclosed dockage reduces pricing efficiency, an example will be presented. Suppose that a foreign buyer purchased two 50,000 metric ton shiplots of U.S. No. 1 HRW wheat for $150 per metric ton (FOB Gulf ports). One shiplot was loaded with wheat that contained 0.44 of a percentage point of dockage, the average of all HRW exports in 1984 that were certificated as "dockage free". The second shiplot was certificated at 0.5% dockage and contained 0.68 of a percentage point of dockage, the average of all HRW exports certificated at that dockage level in 1984.

The calculation of net cost per ton of "millable" material from each lot is presented in table 11. In this example, the buyer paid an average of 39 cents per metric ton

Table 11. A comparison of the costs per unit of millable material for shiplots certificated at different dockage levels

Item	Unit of measure	Ship No. 1	Ship No. 2
Tons loaded	met. tons	50,000	50,000
Dockage content	percent	.4	.68
Certificated dockage	do.	0.0	0.5
Certificated dockage	met. tons	0	250
Net purchase	do.	50,000	49,750
Undisclosed dockage	do.	220	90
Millable material	do.	49,780	49,660
Cost of wheat	thous.dols.	7,500.0	7,462.5
Cost of millable material	dol. per met. ton	150.66	50.27

(1.06 cents per bushel) more for millable material in the shiplot that was certificated as "dockage free" at the U.S. port.

Reasoning along these lines leads to the following question: How much would prices increase if a dockage certification procedure were adopted that would eliminate the problem of undisclosed dockage in U.S. wheat? The answer depends upon the average market price and the average amount of undisclosed dockage. The analysis revealed that aggregate domestic users were paying $10.9 million for hidden dockage, or about 0.95 cents per bushel. Likewise, foreign buyers were paying about $14.8 million, or about 1.01 cents per bushel. Buyers could pay this much more per bushel if the dockage content was accurately certificated.

The price changes can be estimated directly by holding total revenue constant and adjusting the volume by the increase in certificated dockage. The calculations using the weighted average prices for all classes at interior markets and U.S. ports are presented in table 12. Adopting certification Method C would have little impact on merchandisers since the one-cent gain in the base price of clean wheat would be offset by weight correction resulting from a full disclosure of dockage.

Table 12. Projected change in market prices following the adoption of an accurate procedure for certificating the dockage content of U.S. wheat

Certification Method	Marketing year 1984/85		
	Quantity	Price	Revenue
	mil. bu.	dol./bu.	mil.dols.
Method A			
Domestic use	1,155.0	3.7800	4,365.9
Exports	1,362.0	4.1700	5,679.5
Method C 1/			
Domestic use	1,152.1	3.7895	4,365.9
Exports	1,358.7	4.1801	5,679.5

1/The quantity used in domestic markets was adjusted to account for an increase of 0.25 of a percentage point in certificated dockage. The certificated dockage content of exports increased by 0.24 of a percentage point, and the quantity is adjusted by that factor.

Eliminate Many Disputes Between Buyers and Sellers

Proponents of a change refer to buyer confidence in U.S. grade certificates as a reason for change. Others argue that buyers understand the U.S. standards and expect actual dockage to exceed the certificated dockage content. Thus, a major issue concerns the reason for complaints by foreign buyers (5). The unanswered questions are: (a) Which buyers are complaining? (2) What class of wheat are they buying? (3) Are the complaints related to dockage content or undisclosed dockage?

If the reason for complaints relates to undisclosed dockage in U.S. wheat, adopting Method C would solve the problem, and adopting Method B would reduce it substantially. If the complaints relate to the actual dockage content of U.S. wheat, there is no conclusive evidence that a change in dockage certification procedure will result in a cleaner product moving into export channels.

Another source of disputes between buyers and sellers has to do with changes in inspection results from one inspection to another. The magnitude of changes in certificated dockage between inspections would be reduced if Method C were to be adopted. Variability in sampling from the same lot could yield different certificated results under the current method of dockage certification. Consider, for example, a sample

drawn from a lot at the shipping point that has a dockage content of 0.95 percent. If another sample is drawn and inspected at the destination and the dockage content is determined to be 1.05 percent, the certificated dockage content increases from 0.5% to 1.0%, a 100 percent increase! The likelihood of this happening in export grain is great. Lighter dockage tends to segregate as wheat is loaded aboard ships. Consequently, when the ships are unloaded at overseas destinations and divided into sublots, there is a potential for a wide variation in the dockage content of sublots. Some sublots would be exceptionally clean while others would have dockage contents well in excess of the certificated level.

The data presented on the dockage content of U.S. wheat inspected at various ports suggest that if the complaints relate to the actual dockage content of U.S. wheat rather than undisclosed dockage, then the problem may rest mainly with the classes durum and hard red spring. Sixty-two percent of the durum exports had a dockage content in excess of 1.0 percent. In contrast, 95 percent or more of the shipments of the classes HRW, SRW, and WHI had a dockage content below 1.0 percent. A sizeable proportion of hard red winter and white wheat shipments were certified as "dockage free," meaning that the dockage content was below 0.49 of a percentage point and would not be stated on the grade certificate. Most of these lots contained near the maximum amounts of undisclosed dockage that is permitted under current standards which complicates the pricing process.

Alter Current Blending Practices

There is little doubt that the blending practices followed by grain merchandisers would be altered if one of the proposals were adopted. Blending is an accepted practice in the U.S. grain industry where wheat lots with varying quality attributes are blended to develop a uniform lot to meet the specific needs of buyers. Buyers also prefer a uniform product with respect to dockage which is not a grade determining factor, and blending or mixing is an acceptable means of offering a product with a uniform dockage content.

The "free allowance" or potential for undisclosed dockage in the current standards, provides a strong economic incentive to blend to targets just under the break points for certification (0.49%, 0.99%, 1.49%, etc.). Adoption of Method B would reduce the incentive; however, blend targets would still exist. Exporters of durum and hard red spring wheats would likely try to blend to either 0.7 or 1.2 percentage points of dockage. Exporters of other classes would set their target at 0.7 of a percentage point. Those that have cleaning facilities could still ship "dockage free" wheat by lowering the dockage content to 0.25 of a percentage point or less.

Adoption of Method C would eliminate the incentive to blend clean wheat with lots that contain dockage. There would be some incentive to keep wheat clean; therefore, buyers who prefer clean wheat would have better access to such a product.

Incentives for Cleaning

The economic incentive to clean wheat would be affected. A recent study at Kansas State University estimated the partial cost of cleaning wheat at country elevators. An aspiration-type cleaner was found to be an economical approach to lifting lighter dockage from wheat (2). This work was followed up with a case study of a country elevator that is using an aspiration-type cleaner (3). The operating cost associated with this system averaged about 1 cent per bushel handled.

The profitability of cleaning wheat at the first-handler level depends upon the annual volume cleaned, the potential savings in transportation costs, the price received for liftings or screenings, and the potential price premiums for clean wheat. Adoption of certification Method C would bring the potential savings in transportation cost clearly into focus. The economic incentives to clean wheat would be greater if Methods B or C were adopted since the weight adjustments for dockage would be greater for a typical lot of wheat. The decision on cleaning would still rest with the individual farmer or elevator operator; however, there would be no incentive to "maintain the weight" by leaving dockage in the wheat.

Some perceived benefits that would accrue if additional cleaning takes place include improved quality maintenance resulting from a reduced food supply for insects, reduced costs of maintaining pollution control equipment, and a strengthened competitive position of U.S. wheat in world markets. It must be emphasized, however, that changing the method for certificating dockage will not necessarily mean that domestic processors and foreign buyers will receive a cleaner product.

Dockage and Quality Maintenance

A number of studies have focused on the problem of insects in stored grain. The existing literature on the subject identifies temperature, moisture, and dockage as key variables in the life cycle and reproduction of insects in wheat. In general, the rate of development and the reproductive capacity of all grain insects increase with the temperature of the grain mass. Aeration can be used to lower the temperature of stored grain when climatic conditions are favorable. Once the temperature of the grain mass is reduced below a certain point, oviposition ceases and adult insects are short-lived.

Likewise, insects depend upon their food supply for the moisture needed to carry on their life processes. In general, increasing the level of moisture favors rapid increases in the number of insects. If the moisture level is low, the survival rate for insects is greatly reduced. In clean whole-kernel grain, a high moisture content is essential for reproduction and survival.

Since dry, clean wheat is unfavorable for reproduction of insects, the dockage and dust components of a grain mass become important factors affecting the reproduction and survival of insect pest. McGregor found that dockage greatly enhanced the ability of certain insects to develop in stored wheat (6). These results were in agreement with the findings of Cotton, et al. (1). In general, these researchers found that the number of insects present in stored wheat was directly proportional to the percentage of available dockage.

These results indicate that cleaning wheat to remove dockage prior to storage would be one means of controlling certain stored grain insects. Since dockage creates a favorable environment for insects, the adoption of a dockage certification procedure which eliminates the incentive that exists under current standards to leave dockage in wheat to "maintain the weight" would have a favorable impact on quality maintenance. The United States has the capability to produce high quality wheats, and the challenge is to maintain that quality throughout the marketing channel.

CONCLUSIONS

The study led to several conclusions, and most weigh in favor of adopting one of the alternative methods for certificating dockage. The degree to which the potential benefits would be achieved under proposed Methods B and C vary somewhat. The major conclusions are summarized below:

1. More accurate description of the raw grain.

A primary objective of grain standards and inspection services is to accurately describe the physical and biological condition of the grain represented by an official sample. An accurate description of a particular lot of wheat allows processors and millers to estimate its value in terms of product values and translate those values into prices they can bid for the raw grain.

2. More consistent inspection results on the same lot.

There is great potential for inspection results for a particular lot to change from one inspection to another under the current method of certificating dockage. Variability in sampling alone could result in a higher level of certificated

dockage when the true dockage content of a particular lot is near the limit for a particular level of certification. The problem would still exist if Method B were adopted. In contrast, adoption of Method C would eliminate the problem for the most part.

3. Improve pricing efficiency.

The market's ability to provide rewards to sellers of clean grain is hampered under the current system of dockage certification. Buyers must implicitly expect to receive near the maximum amount of "hidden" or undisclosed dockage in wheat certificated as "dockage free," and market price quotations reflect this expectation. Adoption of Methods B and C would alter these expectations and market prices would adjust accordingly.

4. Remove incentive to blend dockage into clean grain.

The free allowance for dockage under the current standards provides handlers with an incentive to blend high dockage lots with lots of clean wheat. Clean wheat is an excellent raw material to use in blending to reduce the dockage content of high-dockage lots. A lot with 0.9 of a percentage point of dockage can be mixed with a equal size lot of clean wheat to yield a combined lot with an average dockage content of 0.45 of a percentage point which would not be stated on the official grade certificate. This is a legitimate and common practice under current standards. Adoption of Method B would reduce the existing incentive to blend on the basis of dockage, and adoption of Method C would eliminate it completely.

5. Remove subsidy on producers who deliver wheat with a higher-than-average dockage content.

Producers who deliver clean wheat subsidize the price received by those who deliver a higher-than-average dockage content when an elevator purchases wheat on a station-average basis. Adoption of Method C would provide elevator operators with a greater incentive to measure dockage on inbound wheat and assess a cleaning charge on high dockage lots.

6. Place the decision on cleaning on individual elevator operators.

Accurate measurement of dockage would alter decision making with respect to cleaning. The value of dockage as a feed ingredient at the local level, the transportation cost to market, the cost of cleaning, and the dockage content of individual lots are the key variables in the cleaning decision. The marketing strategies of elevator operators may range from cleaning everything to cleaning nothing. Some may clean only the lots that contain excessive dockage. The

economic variables will determine what elevator operators considers to be an excessive dockage content.

7. Facilitate quality maintenance.

If the adoption of an alternative dockage certification procedure leads to an overall reduction in the dockage content of wheat delivered by farmers, existing insect problems would be reduced. Quality maintenance during storage would be facilitated, and dust control problems created during handling operations would be reduced.

8. Alter blending practices.

Adoption of Method B would alter the blend targets for firms that blend to a dockage content just below a break point for certification under current standards, e.g. 0.49%, 0.99%, etc. The new targets would be just below 0.25%, 0.75%, etc. Handlers who have cleaning facilities could still market "dockage free" wheat if the average dockage content was lowered to 0.25 of a percentage point or less. Adoption of Method C would eliminate the incentive to blend high-dockage lots with clean lots.

9. Economic impact would be small.

Under average market conditions the economic impact of adopting Method B was estimated to total $13.3 million dollars. In contrast, adopting Method C would result in an impact of about $1 million. Market price quotations for clean wheat would increase and this would offset the weight reductions resulting from a higher level of certificated dockage.

10. Improve the competitive position of U.S. wheat in world markets.

The U.S. produces a wide range of wheat classes and is dependent upon high and stable exports to dispose of a sizeable share of annual production. Wheats offered by other exporters are substitutable for U.S. wheats in certain markets and certain uses. If a buyer judges price and important quality characteristics to be about equal, his decision may come down to one of cleanliness. Developing and maintaining a strong export market depends upon delivering a clean, high quality product along with a grade certificate that accurately describes the physical and biological condition of that product.

REFERENCES

(1) Cotton, R. T., H. H. Walkin, G. D. White, and D. A. Wilbur. Causes of Outbreaks of Stored Grain Insects, Bul. 416, Kansas Agr. Exp. Sta. and U.S. Dept. Agr., Feb. 1960.

(2) Fridirici, Roxane, Harvey L. Kiser, L. D. Schnake, and John Wingfield, A View on the Economics of Removing Dockage from Wheat, Kansas Agr. Exp. Sta. in coop. with Kansas Wheat Commission, July 1984.

(3) Kiser, Harvey L. Cleaning Wheat at a Country Elevator: A Case Study, Kansas Wheat Commission and Kansas Agricultural Experiment Station, Manhattan, Ks., 1984.

(4) Leath, Mack N. Economic Implications of Alternative Methods of Certificating Dockage in U.S. Wheat, Econ. Res. Serv., 1986, (forthcoming).

(5) McDonald, Dale. "Why the World Doesn't Want Our Wheat," Farm Journal, October 1985, pp. 13-17.

(6) McGregor, H. E. "Preference of Tribolium Castaneum for Wheat Containing Various Percentages of Dockage," Journal of Economic Entomology, vol. 57, 1964, pp. 511-513.

(7) U.S. Department of Agriculture, Grain and Feed Market News, Agr. Mkt. Serv., selected issues.

(8) _____. Wheat Outlook and Situation Report, WS-272, Econ. Res. Serv., September 1985.

(9) _____. Wheat Outlook and Situation Yearbook, WS-271, Econ. Res. Serv., February 1985.

(10) _____. Official United States Standards for Grain, Fed. Grain Insp. Serv., May 25, 1985, pp. 1.1-1.11.

(11) U.S. Government Printing Office. Federal Register, vol. 49, no. 96, May 16, 1984.

AN ECONOMIC EVALUATION OF CHANGING THE INTERMEDIATE REFERENCE METHOD FOR MOISTURE CONTENT IN CORN

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Measurement of moisture is an important determinant of the storability characteristics of corn. Accurate measurement is also necessary to estimate the quantity of corn and water being weighed and sold as grain. The Federal Grain Inspection Service (FGIS) is considering the adoption of a different intermediate reference method for moisture content with the retention of the Karl Fischer procedure as the reference method. The purpose of this paper is to evaluate the economic consequences of changing the intermediate reference method as referenced to the Karl Fischer procedure.

Intermediate Reference Method

The whole-kernel, 103°C, 72-hour, air-oven method has been the intermediate reference method of measuring moisture for many years. FGIS is now proposing to change the laboratory moisture method from the current 103°C, 72-hour, air-oven method to a 130°C, 2-hour, air-oven method based on a ground sample which will be referenced to the Karl Fischer procedure. In addition, the Karl Fischer procedure will be correlated with the Phosphorous Pentoxide Vacuum Dehydration (P_2O_5) Method. Data developed by FGIS shows that the current USDA air-oven method understates the actual moisture by approximately 0.7 percent, compared to the Karl Fischer procedure and the P_2O_5 methods.

This difference in moisture results is well documented, but since all moisture meters are calibrated against the 103°C, 72-hour, air-oven method, there has been reluctance to change. Foreign buyers of corn also recognize that the moisture content as stated on the Certificate Final for corn leaving U. S. ports is underestimated by about 1 percent, and they are beginning to complain about this discrepancy. About 0.7 of the 1 percent difference is due to the proposed change in the intermediate air-oven method as referenced to the Karl Fischer procedure. The remaining 0.3 will come about through re-calibrating the moisture meters currently in use. This paper will focus on the economic impact of changing the intermediate air-oven method.

Economic Losses To Participants

The starting point for evaluating the potential impact is to look at the current and projected supply and demand situation. The official supply and disappearance estimates for 1983/84 and 1984/85 marketing years are shown in Table 1. The ending stocks for September 30, 1984 are projected to total 520 million bushels. Production in 1984 is currently estimated at 7,775 million bushels.

Cost of Inventory Shrinkage

An immediate impact would be a paper shrinkage of current inventories at the point of change to the new intermediate oven method. This change is summarized in Table 2. The "paper" losses on carryover stocks, if the change is made in August of 1984, would total about $14 million. Losses on corn stored under warehouse receipts such as CCC-owned stocks would be absorbed by the owners. Consequently, about 33 percent of the loss on stocks would be absorbed by CCC.

Table 1. Supply and disappearance for corn, 1983/84 and 1984/85, as of May 10, 1984

Item	Marketing year	
	1983/84	1984/85 (range)[a]
	Millions bushels	
SUPPLY		
Beginning stock	3,140	520
Production	4,204	7,775 ± (785)
Imports	1	1
Total	7,345	8,296
DISAPPEARANCE		
Food/Ind/Seed	950	1,025 ± (30)
Feed	3,975	4,125 ± (350)
Total domestic	4,925	5,150 ± (365)
Exports	1,900	2,025 ± (225)
Total use	6,825	7,175 ± (500)
Ending stock	520	1,121 ± (300)
Status of stocks:		
Farmer-owned reserve	50	NA
CCC inventory	175	NA
Free	295	NA
Average farm price	3.25	2.65-3.20

[a]The probability is 2 out of 3 that the final outcome for 1984/85 will be within this range.

Table 2. Estimated cost of shrinkage on carryover stocks, October 1, 1984

Stocks by position	Old method	New method	Estimated cost[b]
	Thousands of bushels		Thous. dol.
Farmer-owned reserve	50,000	49,586	1,345
Commodity credit corporation	175,000	173,562	4,674
Free stocks	295,000	292,556	7,943
Total	520.000	515,692	13,962

[a]Net bushels = $\frac{100 - 16.2}{100 - 15.5}$ x Current Bushel

[b]Valued at $3.25 per bushel.

The proportion of the free-stocks that are stored on farms and will be fed to livestock is included in the above calculations. The value of this corn for livestock feed will not change. Thus, if one assumes that about 50 percent of the free stocks fall into this category, the actual cost of shrinking inventories would drop to about $10 million.

Delaying the effective date until August, 1985 will double the estimated cost since carryover stocks will be greater on September 30, 1985.

Drying and Mixing Opportunities

A major impact on industry relates to the potential impact on drying and mixing (D&M) margin with which elevators work. D&M is one of the major components of gross profit and as such impacts significantly on the margins elevators work with. Before the impact can be properly evaluated, it is important to establish the seasonal pattern in which U. S. farmers market corn. Quarterly data for the 1977/78 through 1979/80 marketing years are shown in Table 3. The proportion sold during the fall (harvesttime) averaged about 34 percent during that period. Comparing those data with results for earlier years reveals that the trend has been a decline in fall sales with corresponding increases in farm drying and storage capacity that has occurred over time.

The opportunity to gain from D&M depends on the quality and moisture content of old-crop corn in commercial storage and the amount and moisture content of new-crop corn delivered by producers at harvest. A reasonable assumption would be that farmers probably deliver corn that averages about 21-22 percent moisture in the fall. This will vary somewhat from year to year, depending upon planting and harvesting dates, as well as weather conditions at harvesttime. Recent studies to determine the costs of on-farm drying and conditioning of corn assume a beginning moisture content of either 21 or 22 percent and a

Table 3. Seasonality of Corn Sales from U.S. Farms, 1977/78 - 1979/80

Season	Marketing year			Average
	1977/78	1978/79	1979/80	
	Percentage			
Fall (Aug. - Dec.)	36.6	31.9	33.0	33.8
Winter (Jan. - Mar.)	26.7	25.8	23.6	25.4
Spring (Apr. - June)	20.8	22.3	18.8	20.6
Summer (July - Sept.)	15.9	20.0	24.6	20.2

final moisture content of 15.5 percent. This analysis assumes that moisture delivered off-farm during the fall will average 21.5 percent moisture.

The quality and moisture content of the corn currently in commercial storage is unknown. Much of the profit from D&M involves the mixing of high-damage, old-crop corn with high-moisture, new-crop corn. The impact on profits from blending damaged grain is beyond the scope of this report.

An evaluation of the D&M issue also depends on the moisture content of grain delivered from the farm this spring and summer. A recent survey of Illinois farmers to determine the average final moisture content of corn after farm drying showed that moisture content after drying averaged 14.6 percent (Table 4). Corn stored for long periods will lose additional moisture, so it is assumed that corn moving to market in the coming months may average 14 percent moisture or less. For purposes of this analysis, 14 percent is assumed for the carryover inventory. It is also assumed that commercial stocks will total 270 million bushels at the end of the current marketing year.

The estimated impact on D&M revenues is summarized in Table 5. About 52 percent of carryover stocks is assumed to be in commercial storage and availa-

Table 4. Average Final Moisture Content of Corn Dried on Illinois Farms by Type of Dryer, 1977 and 1980[a]

Type of Dryer	Crop Year	
	1977	1980
	Moisture (%, w.b.)	
Continuous flow	14.4	14.6
Portable batch	14.3	14.3
Bin with gas heat	14.4	14.5
Bin with electric heat	15.0	14.5
Bin with solar heat	----	15.0
Bin with no heat	15.0	14.4
Simple average	14.6	14.6

[a]Results based on data collected through a survey of about 1,000 farmers to determine the final moisture content of corn dried in their farm dryers.

Source: Grain Quality Newsletter, Vol. 5, No. 3, October, 1983.

ble for blending with new-crop corn delivered at harvesttime. The disposition of farm-stored carryover stocks has no bearing on the analysis. If those stocks are fed to livestock on the farm where stored, the change will not affect the feeding value. Since elevators generally do not discount corn below 15.5 percent moisture, the change should not affect the price bid for old-crop corn. The shrinkage cost on stocks was evaluated in the previous section.

This analysis indicates that removing an extra 0.7 percent moisture from the 1,654 million bushels that would be dried would cost about $23 million, which would likely be passed back to farmers in the form of higher drying charges. Producers would also face a shrinkage cost on harvesttime sales of $42 million (14 million bushels at $3.00 per bushel). The increase in cost because of decreased blending opportunities would amount to about $4 million.

Table 5. Impact on Drying and Mixing Opportunities from changing the Intermediate Oven Method in Fall of 1984 and 1985

Item	Unit of measure	Fall of 1984		Fall of 1985	
		Old crop	New crop	Old crop	New crop
Assumptions					
Farm stocks	mil. bu.	250	---	538	---
Commercial stocks	mil. bu.	270	---	583	---
Drying charge per point	cents	---	2	---	2
Current Reference Method					
Harvesttime sales[a]	mil. bu.	---	1,722	---	1,815
Average moisture (w.b.)	Pct.	14.0	21.5	14.0	21.5
Average blended moisture	Pct.	15.5	15.5	15.5	15.5
Quantities blended	mil. bu.	270	68	583	146
Quantity dried	mil. bu.	---	1,654	---	1,669
Drying charges	mil. dol.	---	198	---	200
New Reference Method					
Harvesttime sales[a]	mil. bu.	---	1,708	---	1,800
Average moisture (w.b.)	Pct.	14.7	22.2	14.7	22.2
Average blended moisture	Pct.	15.5	15.5	15.5	15.5
Quantities blended	mil. bu.	268	32	578	69
Quantity dried	mil. bu.	---	1,676	---	1,731
Drying charges	mil. dol.	---	225	---	232
Economic Cost					
Shrinkage on farm sales[b]	mil. dol.	---	42	---	45
Drying charge increase[c]	mil. dol.	---	23	---	23
Loss of D&M income[d]	mil. dol.	---	4	---	9

[a]Assumes 33.8 percent of quantity sold off-farm is sold at harvest.

[b]Shrinkage valued at $3.00 per bushel.

[c]Cost of removing 0.7 percent at two cents per point of moisture from quantity dried under current reference method.

[d]Additional drying resulting from less blending.

This amount would probably be offset by increases in charges for other services such as storage. Delaying the effective date until the 1985 crop would increase cost by $8 million ($3 million in shrinkage and $5 million in D&M revenue). D&M revenue would be greater in 1985 because the old-crop carryover

available for blending would be larger.

Farm Drying Cost

The evidence in Table 4 indicated that farmers are already drying corn beyond the 15.5 percent base moisture. Therefore, increasing the moisture reading by 0.7 percent would increase the average final moisture after drying to 15.3 percent. A moisture content of 15.5 is considered safe for short-term storage (fall through late spring). For long-term storage of 1 year, a moisture content of 14.0 percent is recommended. Since these recommendations were developed under the current USDA air-oven method, these levels could be increased 0.7 percent after the intermediate air-oven method is changed.

Since farm-dried corn is below the base moisture level, there will not be a shrinkage cost associated with that proportion of the crop that is dried and stored on the farm. A bushel will continue to weigh 56 pounds. Assuming there is no change in the "actual" moisture content delivered from farm storage there should be little impact on commercial storage and marketing practices outside the harvest season.

Impact on Brittleness

The impact of changing the intermediate air-oven method on breakage is difficult to quantify. Elevator managers still must take into account the safe storage level in determining how much to dry the corn received at harvest. Managers have developed storage practices and rules using moisture readings calibrated against the current air-oven method. Changing to the intermediate air-oven method will not change the storage practices. If managers have had success storing corn with a moisture content of 15.0 percent on the current intermediate oven method, they could store corn with a moisture content of 15.7 percent under the new intermediate oven method and expect the same degree

of success.

Since farm-dried corn is currently dried more than necessary to meet the standards, changing the intermediate oven method should have no significant impact on the "actual" moisture content of corn delivered from farm storage. Consequently, there will be little change in the "actual" moisture content of grain handled during most of the marketing year, and breakage should not change significantly. The Agricultural Stabilization and Conservation Service (ASCS) is currently using 14.0 percent as a base moisture for the CCC-loan program and discounting corn with a higher moisture content. ASCS will probably increase in base moisture content for the loan program when the new intermediate air-oven method is changed; therefore, farm-drying and conditioning practices should not change under the new method.

Economic Gains to Participants

Any discussion of economic gains is related to the intrinsic value of grain. At the time corn is harvested, the value of production is determined by the total quantity of dry matter harvested and the total value of end-products that can be produced from that dry matter. The water in the grain has very little intrinsic value. The moisture content affects storability, but it has little effect on the value of the dry matter. Removal of water from corn by drying is a quantity change rather than a quality change. Thus, lowering the moisture content by 0.7 percent will increase the percentage of dry matter by 0.835 percent, and the net result would be an increase in the volume of end-products that can be produced from a 56-pound bushel of corn. Consequently, processors and foreign buyers would need to buy fewer bushels and should be willing to pay a slightly higher price per bushel. If U. S. exporters could obtain the same total amount for the slightly smaller volume, the average FOB

price at U. S. ports could increase by about three cents per bushel. The intrinsic value of corn exports would remain the same and foreign buyers would still enjoy the savings in ocean freight cost. Competitive relationships within the industry would determine how much of the price increase would be passed back in terms of higher bids for grain.

Domestic Transportation Cost

Under the new intermediate air-oven method, processors and other buyers will need fewer bushels to produce the same volume of end products. The net result will be a reduction in the volume shipped. This reduction would amount to about 50 million bushels in 1984/85 marketing year (Table 6). The total transportation bill would be reduced by $9 million.

Table 6. Estimated Savings in Transportation Cost Under New Intermediate Oven Method for Moisture in Corn, 1984/85

Type of Shipment	Average rate	Old Method		New Method	
		Volume shipped	Total cost	Volume shipped	Total cost
	c/bu.	mil. dol.	mil. dol.	mil. bu.	mil. dol.
Domestic					
Intrastate	10	2,800	280	2,777	278
Interstate	30	1,200	360	1,190	357
Port destinations	25	2,025	506	2,008	502
Total	---	6,025	1,146	5,975	1,137

Ocean Freight Cost

Ocean freight cost on export grain would also be reduced since buyers would need fewer bushels. Assume that exports would total 50 million metric tons (MMTs) under the current method. Under the new system, buyers would need

only 49.586 MMTs. Assuming that ocean freight averages $15 per metric ton, a savings of $6.2 million accrues to foreign buyers of U. S. corn.

SUMMARY OF ECONOMIC COST

A summary of the economic costs associated with the proposed change is presented in Table 7. Changing the intermediate reference method in 1984 would have a total impact of $83 million. This total would be offset somewhat by a potential savings in transportation charges of $15 million. To the extent that "actual" moisture content of corn traded after December will not change, the potential savings in transportation will be less.

Data on the actual moisture of grain traded in domestic channels is not available at this time. A review of loading-logs since January 1 for export corn revealed that most exports' shipments would be under the maximum moisture content specified in the contract if the moisture readings were increased by 0.7 percent. The difference between average moisture and maximum moisture under export contracts is likely to be much closer during the fall so the extra drying associated with corn delivered at harvesttime would be required (Tabel 5).

The question of how the impact would differ if the change to the new intermediate reference method were delayed to 1985 is also addressed in Table 7. It is estimated that the impact would be $22 million greater in 1985. The increase is due primarily to shrinkage associated with a larger carryover stock. The impact on drying and mixing revenues will also be greater with the expected increase in carryover stocks in commercial positions.

Table 7. A Comparison of Alternative Dates to Change to New Intermediate Oven Method

Item	Change effective for	
	1984 Crop	1985 Crop
	Millions of dollars	
Economic Costs:		
Shrinkage in Stocks	14	28
Shrinkage on Fall Sales	42	45
Commercial Drying Charges	23	23
Farm Drying Costs	0	0
Drying and Mixing Revenue	4	9
Total	83	105
Economic Gains:		
Lower Domestic Transportations	9	9
Lower Ocean Freight	6	6
Total	15	15
Net Economic Impact	68	90

CONCLUSIONS

The division of income between producers and elevators is determined by competition and not by the intermediate reference system for moisture. Moisture is a condition of corn and not a quality factor; however, it must be managed properly because it affects the storability of corn.

Changing the intermediate base reference method will have an impact on all participants in the corn marketing process. Drying and mixing revenues will be affected, and stocks in commercial storage at the time of change will have a shrinkage cost. There will also be an increase in drying charges and shrinkage factors applied to wet corn delivered at harvest. These charges will likely be passed back to producers.

Producers will have to weight the higher drying charges against greater

field losses associated with harvesting lower moisture corn. The key issue for the producer is the value of field loss due to a delayed harvest versus the increased cost of drying and conditioning.

The economic costs related to the proposed change are difficult to quantify. In fact, some of the impacts cannot be quantified economically. The fact that costs are involved is not a good reason to resist changing to a new intermediate reference method. The current method of measuring moisture is inaccurate, and it should be corrected. The competitive nature of the grain market would suggest that major foreign buyers and domestic processors have already discounted the understatement of moisture in pricing U.S. corn. The integrity of our Official Inspection Certificate requires that we accurately measure moisture content. In the long run I feel that the competitive position of U. S. corn in world markets will be enhanced.

WEDNESDAY, MARCH 19, 1986.

AGRICULTURAL RESEARCH SERVICE

WITNESSES

ORVILLE G. BENTLEY, ASSISTANT SECRETARY, SCIENCE AND EDUCATION

TERRY B. KINNEY, JR., ADMINISTRATOR, AGRICULTURAL RESEARCH SERVICE

MARY E. CARTER, ASSOCIATE ADMINISTRATOR, AGRICULTURAL RESEARCH SERVICE

THOMAS J. ARMY, DEPUTY ADMINISTRATOR, NATIONAL PROGRAM STAFF, AGRICULTURAL RESEARCH SERVICE

EDWARD B. KNIPLING, ASSOCIATE DEPUTY ADMINISTRATOR, NATIONAL PROGRAM STAFF, AGRICULTURAL RESEARCH SERVICE

DANNY B. LASTER, ASSOCIATE DEPUTY ADMINISTRATOR, NATIONAL PROGRAM STAFF, AGRICULTURAL RESEARCH SERVICE

THOMAS J. CLARK, ACTING DEPUTY ADMINISTRATOR, ADMINISTRATIVE MANAGEMENT, AGRICULTURAL RESEARCH SERVICE

JOHN R. VICTOR, DIRECTOR, BUDGET AND PROGRAM MANAGEMENT STAFF, AGRICULTURAL RESEARCH SERVICE

STEPHEN B. DEWHURST, BUDGET OFFICER, DEPARTMENT OF AGRICULTURE

OPENING REMARKS

Mr. TRAXLER. The Committee would like to welcome the Assistant Secretary of Science and Education, Dr. Orville Bentley and the fine staff that is accompanying him from the Agricultural Research Service, one of our favorite agencies. Dr. Bentley, for the benefit of the Committee, would you identify your staff appearing here today.

Dr. BENTLEY. Well, thank you, sir.

I am pleased to be here this afternoon and talk about the topic which is very dear to our hearts in the matter of science and education.

Dr. Terry Kinney is here as Administrator of ARS, to speak. There are others in the room, but at this time I think I will recognize Dr. Kinney and I would like to turn to him after I have completed my statement.

Of course, Mr. Dewhurst, who is always here with us, is along with us today, and I am pleased that he is here.

Mr. TRAXLER. As I said this morning, he is always a silent witness.

Do you have some other folks that you want to introduce?

Dr. BENTLEY. Dr. Mary Carter, the Associate Administrator for ARS, is here. Dr. Mary Nell Greenwood, the Administrator of the Extension Service, is here. Mr. Joe Howard of the National Agri-

cultural Library will be here this afternoon. And there are others, but I think that will be enough for the introduction.

Mr. TRAXLER. That will take care of the first row, first in.

Dr. BENTLEY. First in. And if there is time, we hope that you can hear from each one of those.

Mr. TRAXLER. The Chairman asked to extend best wishes and greetings to all of you, and he may be able to join us, but we are uncertain. He is controlling the time on the Nicaraguan debate taking place on the House floor. We hope he can get over, but if he cannot, he wanted you to know that he is sorry that he could not be with you and, naturally, will be in further touch.

So we will put your entire statement in the record, and you may summarize if you wish.

Dr. BENTLEY. Thank you. I am pleased to do so.

Actually, there are a few overview statements I would like to make having to do with not only the Agricultural Research Service but the Cooperative State Research Service, the Extension Service, and National Agricultural Library as well.

As a budget overview, our budget this year is one that has been developed under some difficult conditions and stringencies. This year we are asking for $913 million for the agencies I referred to, and that is down from an estimate of $1.1 billion for 1986.

We realized, as we were developing this budget, that we had to be concerned about the economic problems that farmers face and our food and fiber system is facing and, therefore, we are thinking of steps that we can use of our capacity and resources to improve the economic situation, and improve the profitability of the farm enterprises throughout the country.

NEW USES FOR FARM PRODUCTS

We are also mindful of the fact that the current supply situation has a depressing effect upon commodity prices, and we have recommendations in the budgets of at least two of the agencies that deal with the thrust for improving the outlets for our major crops, corn, wheat, soybeans and cotton. We are looking for ways of expanding markets for these particular products. This is something that has been a part of the programs for our agencies, both in the experimental stage, but especially ARS for a long time. But we are getting this additional emphasis in this year's budget recommendations.

We hope that we can find places to utilize agricultural commodities in the production of feedstocks and specialty chemicals, new packaging and bonding materials and, of course, new food products that would serve our domestic markets and could be available for export.

Dr. Kinney will be talking about not only these topics but others that deal with the developments in science that will have, we think, a very positive effect upon the future of agriculture.

PLANT GERMPLASM

We are also wanting to give increased attention for work on plant germplasm research. We know that one of the very best ways, and one of the most productive ways, we can use this knowl-

edge about the germplasm genetic material is to find ways to incorporate this new material into plants that will be more efficient in the utilization of water, of fertilizer and of chemicals, and will withstand diseases, insects, be more drought tolerant or will have a stronger or greater capacity to deal with stress.

COOPERATIVE RESEARCH

In the Cooperative State Research Service budget, we call attention to the excellent program that we have initiated, and with the help of the Congress and the help of the Executive Branch, in the competitive grants program. The response in 1985 to the announcement of this program was very heartening. In fact, I have been informed that we were able to award only one grant for every five proposals that were submitted from various universities and institutions and other Federal agencies. We think that this has been a very positive effect, especially in addressing basic research that deals with biotechnology, the new genetic material and molecular biology, and its potential and exciting applications that we look forward to for agriculture and in our food system.

EXTENSION SERVICE

In the Extension Service budget, we are proposing the elimination of earmarked programs and we are recommending a reduction in the general formula program. Under this funding level we will continue to provide assistance to the States in identifying priorities, adapting research results and coordinating efforts among the local extension services.

These are large reductions. We are confident that the Extension System will survive with the support of State and local governments.

We think that the formula distribution program that the Extension Service, and it is used in the Cooperative State Research Service, provides a great deal of flexibility.

We are pleased that the effort of the State extension service system is supported by the Federal Extension Service in developing programs that will assist farm families. Over one hundred thousand farm families have received assistance in financial management and under the program we referred to as profitability for farmers. We think this is an important one, and the funding that is provided is justified in large measure by the success and need for the continuation of these programs.

NEW FARM PROGRAMS

In the program area, we would like to call attention to the fact that in the 1985 Farm Bill, there were a number of initiatives identified and program opportunities opened up to farmers, ranchers throughout this country, one being the matter of the long-term land retirement contracts. We think that this new program will raise a number of questions, and we hope that through all of our research programs and certainly our Extension activities we can give assistance to farmers as they begin to evaluate the various op-

portunities that might be made available to them under the 1985 Farm Bill.

NATIONAL AGRICULTURAL LIBRARY

Just a word or two about the National Agricultural Library. We look at this as a very important factor in our research and education programs, and we want to be sure that we continue to develop the kind of resources that can be shared, not only with the scientists in our Agricultural Research Service, but with libraries throughout the country and some interactions on an international basis.

SCIENCE AND TECHNOLOGY INITIATIVE

If I could call attention to a number of activities, but I will not take time now but rather close by saying very briefly that we see the science and technology initiative as an integral part of our efforts on the part of our industries and on the part of agriculture to retain and strengthen our competitive position in world markets. The matter of competition in manufacturing and in the production of all kinds of goods and services is important to the future economy of this country, and we see the role of science and technology as very important in identifying new areas, new opportunities, new ways we could use the great resources of our agricultural system of the United States.

I thank you for giving time for this overview. I would now turn to Dr. Kinney.

[CLERK'S NOTE.—The full text of Dr. Bentley's prepared statement appears on pages 434 through 438.

Mr. TRAXLER. Please. We would be glad to hear from him.

Dr. Kinney.

STATEMENT OF DR. KINNEY

Dr. KINNEY. Thank you, Mr. Chairman.

I am pleased to have the opportunity to appear before this Committee again. I, first of all, would like to introduce six additional people that are with me today. Dr. Mary Carter, my Associate Administrator, Dr. Tom Army, my Deputy for National Program Staff, and his two associates, Dr. Ed Knipling and Dr. Dan Laster, my Acting Deputy Administrator for Administrative Management, Tim Clark, and my Budget Officer, John Victor.

I ask that my complete statement be submitted for the record and I want to make just two or three points that are kind of an overview of some of the things that I think are important.

[CLERK'S NOTE.—The full text of Dr. Kinney's prepared statement appears on pages 439 through 447. The explanatory notes appear on pages 448 through 499.

ARS is a problem-solving agency, Mr. Chairman. As such, we do whatever research is necessary to fulfill that objective, to solve problems. We establish our research priorities through close communications and our planning and priority setting with the Department, with the Congress, with farmers, with industry groups, whomever we service.

We have short and long-range plans to assure that the highest priority needs are addressed. We have plans that will assure that we have the expertise in the future and the resources to fulfill our mission.

RESPONSE TO CONGRESSIONAL DIRECTIVES

There are two items I would like to submit for the record. One is the were 46 issues that were addressed to ARS in the Conference Report on 1986 Appropriations and the 1985 Farm Bill. We looked at each one of these 46 directives, and we have summarized how we are addressing these in response to the Congress.

I would like, Mr. Chairman, to submit that for the record if that is okay.

Mr. TRAXLER. It will be received.

[Information follows:]

Agricultural Research Service
Actions in Response to Congressional Directives
(FY 1986)

1. Food Toxicology. Recommends $200,000 for the continued assessment of dioxin contamination in the Great Lakes food chain and the agricultural production system.

   ARS will continue in 1986 to support grants totaling $190,300 at Michigan State University for toxicology research on dioxin under the direction of Dr. Lawrence Fisher, Director of Center of Environmental Toxicology.

2. Integrated Production Research. For the South Central Agricultural Research Center at Lane, Oklahoma, recommends $500,000 an increase of $200,000 above the budget. These additional funds will be coordinated with the expansion of the Center.

   Additional funds of $200,000 will be used to support a plant pathology research scientist on post-harvest disease problems of fruit and vegetables. This increase brings the total base support at Lane to $498,900 and 3 SYs.

3. Tracheal and Varroa Mites. Will expect the Department to devote the necessary resources to this field of research. Directs ARS to increase attention given to research on the Varroa mite.

   ARS established in 1985, a new bee research laboratory at Weslaco, TX, to specifically address the tracheal mite problem. Base resource levels are $322,500 and 2 SYs. Plans in 1986 are to further strengthen this research. Varroa mite research is carried out via cooperative research in foreign countries, since the mite is not present in the U.S.

4. Pesticide Research. Will expect adequate resources to be directed to pesticide research which is also a priority research field for the beekeeping industry. Expects ARS to continue research in this field. The Committee is aware of laboratory space in an ARS facility in Stillwater, OK, which could be utilized for such research.

   ARS currently conducts bee pesticide research at Weslaco, TX; Beltsville, MD; Madison, WI; and Tucson, AZ. Estimated resource levels are $120,000 and 0.8 SY. Plans in 1986 are to consolidate the Stillwater program at Weslaco to achieve a stronger critical research mass on pesticides as related to tracheal mite control.

5. Nutrition Research. The Conference agreement provided for (the following increases):
   a) HN Center, Tufts University.....$1,000,000
   b) Children's Nutrition Research Center..... 1,000,000
   c) North Dakota HN Center..... 400,000
   d) Beltsville HN Center..... 200,000

ARS will use these increases for expanded research as follows:

a) Tufts - nutritional requirements of the elderly
b) Baylor - nutrition studies on infants, children pregnant and lactating mothers
c) Grand Forks - trace mineral dietary requirements
d) Beltsville - metabolic functions of nutrients; dietary needs to maintain health, prevent diseases.

6. National Arboretum. An increase of $500,000, this increase when added to the restoration of the five percent pay reduction will restore the funding level for the Arboretum to approximately the same level as last year.

Increase funds will be used to support the existing Arboretum program, rather than adding new scientists or otherwise expanding the program. Initially funds will be used to improve laboratory and greenhouse space.

7. Catfish Breeding. Recommends (an increase of) $500,000 to establish a catfish breeding, genetics and endocrinology program at the Delta States Research Center.

Funds will be used in 1986 for catfish pond construction, followed by establishment of a 2 SY program in 1987. Research will emphasize catfish genetics for efficient meat production and disease resistance. In cooperation with Delta Council and Mississippi Catfish Growers Association, land leases and design criteria for pond construction are currently being negotiated.

8. Water Conservation. Increase of $250,000 to augment the existing plant stress and water conservation research now underway at Texas Tech University and the Texas Agricultural Experiment Station.

This program increase will bring the ARS base resources on plant stress research at Lubbock, TX, to a total of $1,243,500. The new funds will strengthen existing research efforts aimed at solving drought problems by adding one scientist to the program.

9. Fruit Research. Expects the Department to give additional attention to the important research being conducted on post-harvest research at Wenatchee, as well as research on insect biology and pest management being done at Yakima, WA.

Within existing resources at Yakima ($2,310,400) and Wenatchee ($1,013,700), ARS will continue research on pest problems and increase effort on post-harvest. At Wenatchee fire-blight research and biological control of pathogens research will be accelerated. An entomologist vacancy at Yakima will be filled to address insect genetics and management problems (codling moth, pear psylla).

10. Limited Tillage Research. Recommends $100,000 for (the continuation of) integrated weed control and management research in limited tillage systems for forages and crop rotation. Recommends $100,000 for (the continuation of) increased basic research and physiological-biochemical research leading to the protection of crops from the effects of weeds insects, diseases, and other pests.

    ARS is continuing these programs at Ithaca, NY, in 1986. The program was accelerated by a $200,000 program increase in 1985. These funds are a permanent part of the Crop Protection Research Unit at Ithaca.

11. Fresno Research Station. Recommended bill language to allow for the purchase of land at Fresno, CA, in order to relocate the existing research facility.

    Land in question is 30 acres owned by Sun-Diamond corporation adjacent to 20-acre U.S. Horticultural Field Laboratory at Fresno, CA. An appraisal conducted in 1985, valued the land at $15,000 per acre, or minimum total of about $450,000. Funds were not appropriated by Congress and are not available within the ARS appropriation to purchase the land in FY 1986.

12. Citrus Research. Recommended bill language to allow for the construction of the National Clonal Germplasm Repository for Citrus at Riverside, CA. Directs ARS to continue the Emergency Canker Research Program originally funded in the fiscal year 1985 continuing appropriations bill. One million dollars shall be made available for this program in fiscal year 1986 with $750,000 provided to the University of Florida and the remaining $250,000 to be used by the Agricultural Research Service facility at Orlando, FL.

    The citrus repository at Riverside, CA, is now in the A&E design phase and supported by a $475,600 design/construction allocation from 1986 ARS germplasm funds. Construction is expected to start later in 1986 and be completed in 1987.

    The citrus canker program will continue in 1986 with the $1 million recurring emergency funds appropriated in 1985 as adjusted by the general reduction provided by Conference action and Gramm-Rudman sequestration. ARS will continue a University of Florida cooperative agreement and provide funds to the Orlando ARS lab and to Beltsville, MD, where specialized research quarantine greenhouses exist in support of the Florida problem. Additional funds are allocated to canker research at Beltsville. The total ARS canker research program in FY 1986 (inhouse and extramural) is $1,106,000.

13. Beltsville Research Center. Expects to be kept fully advised as the Department works to restore and upgrade the Beltsville Agricultural Research Center.

ARS continues to give high priority to support of Beltsville research programs and physical resource maintenance. Since 1984, $4.2 million additional recurring base funds have been allocated to Beltsville for new and expanded high priority research efforts. An additional $2.3 million has been allocated on a one-time basis for facility upgrading in the past 3 years. A facility upgrading plan was formulated in 1985, with an 8-year projected cost-estimate of $162 million. Laboratory realignments have occurred to focus resources on the highest priority problems and science approaches. Current Beltsville base resource strength is $66.8 million and 400 SYs.

14. National Sedimentation Laboratory. Recommends an increase of $250,000 to expand the work now underway at the National Sedimentation Laboratory on the Yazoo Basin Demonstration Projects.

The $250,000 increase will be used to expand field evaluation of conservation measures, develop photogrammetric reconnaissance measures, and use erosion/sedimentation models to integrate watershed data. This increase along with the 1985 recurring increase of $350,000 brings the total Demonstration Erosion Control (DEC) project to the $570,800 level as adjusted by the general reduction provided by Conference action and Gramm-Rudman sequestration. A non-recurring $1.4 million 1985 allocation is being used for laboratory expansion; construction is now underway and to be complete in January 1987.

15. Tri-fly Research. (An increase of) $340,000 for work with the University of Hawaii to develop alternative means of eradicating the tri-fly infestation in Hawaii.

ARS and University of Hawaii officials have developed coordinated plans on use of this $340,000 increase. Emphasis of University projects will be on melon and oriental fruit fly species since ARS base program emphasizes med fly. Research thrusts will be on genetic and biotechnology approaches as well as field behavior/ecology studies. Both ARS and Hawaii will collaborate in field-scale pilot tests of eradication technology.

16. Grape Rootstock. Expects adequate funds (to) be provided for this research.

Grape rootstock research will be supported by ARS in 1986 at the $76,100 level. This research is at Fresno, CA. Other ARS grape research relates to diseases in grape germplasm (Fresno, CA, $50,700; Davis, CA, $104,700). ARS is coordinating with the University and industry in developing options for accelerating the grape rootstock research program at Fresno with a portion of the Davis funds.

17. Stirling Engine. Expects the Department to consider the possibility of funding research proposals for the Stirling Engine.

The Department has actively considered this issue. An ARS assessment was conducted and a report submitted to Congress in early 1985. The Department's position is that further engineering developments of the Stirling engine are outside the mission of ARS and that funds to support this work are not available. ARS has expressed a willingness to consider participation in agricultural applications research, after the necessary additional engineering developments are complete.

18. Veterinary Medicine at Tuskegee Institute. Recommends (an increase of) $600,000 for planning for a new facility to be located within the School of Veterinary Medicine at Tuskegee Institute.

Following reductions mandated by P.L. 99-177, the Balanced Budget and Deficit Reduction Act of 1985, $570,800 is available to plan a facility at the Tuskegee University School of Veterinary Medicine. It is our understanding that State funds will be provided in addition to the Federal support and that the facility will be located on university property. This arrangement indicates a State-owned, rather than a Federal facility. Therefore, the Department intends to make available through the Cooperative State Research Service a grant in the amount of the appropriated funds referenced above. The grant will provide for ARS use of the facilities in accordance with the language appropriating the funds.

19. Plant and Animal Sciences, University of Illinois. Recommends (an increase of) $3,000,000 for planning of a plant and animal sciences research center at the University of Illinois.

Following reductions mandated by P.L. 99-177, the Balanced Budget and Deficit Reduction Act of 1985, $2,982,000 is available to plan a plant and animal science research center at the University of Illinois. It is our understanding that State funds will be provided in addition to the Federal support and that the facility will be located on university property. This arrangement indicates a State-owned, rather than a Federal facility. Therefore, the Department intends to make available through the Cooperative State Research Service a grant in the amount of the appropriated funds referenced above. The grant will provide for ARS use of the facilities in accordance with the language appropriating the funds.

20. Veterinary Medicine, Virginia Polytechnic Institute, Blacksburg, VA. Is aware of a proposal regarding phase III of the Virginia-Maryland College of Veterinary Medicine located at Virginia Polytechnic Institute in Blacksburg, Virginia. Will expect the Department to review this proposal and report to the Committee on its feasibility.

The proposal has been reviewed. Recommendations included in the proposal are for additional space and institutional facilities for the College of Veterinary Medicine. The classroom complex would be used as a lecture area, for classroom presentations to students and faculty, as well as for continuing education and scientific meetings. As proposed, the complex would not be used by USDA as an agricultural research laboratory or facility. The proposal would more appropriately be considered under the Research Facilities Act which provides assistance to finance State-owned facilities and equipment.

21. Dairy Forage. Recommends an increase of $200,000 for research at the Dairy Forage Research Center at Madison, WI, and its seven cluster locations.

The $200,000 increase will be used at Madison to hire a new microbiologist to initiate research on microbial activity in silage preservation and on digestion/utilization of forages by dairy cows. This increase brings the total Dairy Forage Research Center funding to $1,962,000. Staffing is 86% complete. An additional 8 SYs and $873,000 are distributed among the 7 cluster locations.

22. Peach Research. Increase of $200,000 for research at the Appalachian Fruit Research Laboratory...to improve the tolerance of peach trees to environmental factors.

This $200,000 increase will be used to accelerate existing research on peach cold hardiness research at Kearneysville, WV. Genetic, physiology, and biotechnology research approaches with post-doctoral research associates will be emphasized.

23. Soil and Water Conservation. Recommends an increase of $200,000 for the Appalachian Soil and Water Conservation Laboratory at Beckley, WV to provide additional staff at the Laboratory. Directs within available funds, to provide 14 full-time equivalent technical support positions to the Appalachian Soil and Water Conservation Research Laboratory at Beckley.

From within available funds, ARS will allocate additional support to the Beckley laboratory for staffing of a new soil scientist.

Fourteen support personnel positions at the Beckley, WV lab, now supported by cooperative agreement appointments with the University of West Virginia, will be converted to Federal positions beginning in the remainder of FY 1986.

24. Sunflower Research. Recommends an increase of $100,000 for a research project at North Dakota State University on the banded moth and other moths most harmful to sunflowers.

These funds will be placed in the ARS Radiation and Metabolism Laboratory at Fargo from which a 3-year specific cooperative agreement with the Entomology Department at North Dakota State University will be established. Project documentation already has been processed.

25. Potato Research. Within the funds for pay annualization, use $150,000 for potato varietal development work in the Pacific Northwest. In addition, out of these funds the conferees will also expect the Department to give increased attention to potato research at Orono, Maine.

The $150,000 increase funds will be placed at the ARS Laboratory in Prosser, WA, from which annual specific cooperative agreements will be established in Idaho, Washington and Oregon to support State potato breeding projects. In order to give increased attention to research at Orono, Maine, and in the northeast production area, ARS has allocated from within available funds a 1986 increase of $68,400 to Beltsville for genetic studies; this includes a $25,000 cooperative agreement with Maine. In addition, ARS has allocated in 1986 $60,000 for a 3-year cooperative agreement with North Dakota State University for continuation of ring-rot disease research which is of concern to potato growers in the Red River Valley region of Minnesota and North Dakota.

26. Fruit Fly. Directs the Department to continue Caribbean fruit fly attractant research.

ARS is giving this research high priority at the Insects Attractants Laboratory, Gainesville, FL. Three scientists and a post-doctoral research associate are addressing this problem. Current research is focused on identification and synthesis of the Caribbean fruit fly sex pheromone. It is the expectation that this pheromone will be incorporated into a lure for fruit fly trapping and control purposes.

27. Grasshopper Fungus. Recommends the same level provided in 1985.

The same level of research activity on the fungus Entomophaga grylli will be continued in 1986. Cooperative agreements are in place with North Dakota State University ($54,600) and South Dakota ($10,000). The ARS Lab at Ithaca, NY, oversees this research. In addition, ARS conducts in-house research at Bozeman, MT, on biology and

control of grasshoppers ($634,400). National Program Scientists are concerned about the potential for further progress on this program and will seek to improve the project direction and productivity.

28. Hops Research. Directs that the USDA-ARS support of hops research in fiscal year 1986 operate at the current level. Expects that all personnel will be retained. Will expect the Committee to be informed prior to any program or personnel changes.

The ARS hops research program is located at Corvallis, OR, and will continue in 1986 at the $191,000 level, the same as in 1985 as adjusted by the general reduction provided by Conference action and Gramm-Rudman sequestration. This funding level includes $75,000 for support of extramural research at Washington State University. ARS has no plans for program or personnel changes for hops research in 1986.

29. Leafy Spurge. Expects the Department to continue funding this program at no less than the fiscal year 1985 level.

ARS continues to give high priority to this troublesome rangeland weed in the Northern and Central Great Plains. ARS funding in 1986 will be $604,500, the same as in 1985 as adjusted by the general reduction provided by Conference action and Gramm-Rudman sequestration. Seven research locations are involved (Albany, Bozeman, Lincoln, Fargo, Sidney, Frederick, and Rome). Research approaches are biological and chemical controls.

30. Rice Research. Expects to at least continue the research activities and staffing levels at the Stuttgart facility commensurate with recent-year levels.

ARS base funding and staffing levels for rice research will continue in 1986 at previous year levels. This includes a total of $197,600 for genetics and weed control research.

31. Integrated Pest Management. Directs that, within funds available, the Federal-State cooperative research program on yellow star thistle be continued.

ARS conducts in-house research ($90,900) at Albany, CA, on biological control of yellow star thistle. An additional $90,900 will continue to be used to support a cooperative Idaho project. ARS is concerned about the poor progress of the Idaho research and its lack of focus. National Program Scientists will review the Idaho research in 1986 and seek to improve the project direction and productivity.

32. Peas and Lentils. Supports continued funding at the 1985 level for pea and lentil research in the Pacific Northwest.

ARS pea and lentil research in the Pacific Northwest will be at the $584,400 level in 1986, $120,100 higher than the level in 1985. The increase supports accelerated germplasm evaluation research at Pullman, WA.

33. Lygus Bug. Recommends that funding be provided to continue the program to control lygus bug on peas and lentils.

ARS is continuing to fund a cooperative agreement on this problem with the University of Idaho. A $55,000 project will be completed in June 1986. Research to date shows that chalky spot damage to pear and lentils is partially attributable to insect species other than Lygus.

34. Vegetable Oil as Fuel. Directs that of the funds provided to ARS, $100,000 be utilized for research being conducted at Moscow, ID, on the use of vegetable oils as a replacement for diesel fuel.

ARS will continue to support this research via a specific cooperative agreement with the University of Idaho using base funds from Tifton, GA. Research focus is on rapeseed and sunflower oils as supplements to diesel fuel.

35. Biological Control. Supports expansion of this research effort and urges USDA to be cooperative in every way possible.

Research on the discovery of biological control agents for mole crickets is continuing at the University of Florida. ARS is partially supporting this research in 1986 with a $28,500 cooperative agreement.

36. Lesser Cornstalk Borer, Mole Cricket, and Diaprepes. This work should be continued.

ARS at Tifton, GA is continuing in 1986 to support extramural research with the University of Florida on the lesser cornstalk borer and mole cricket; a $28,500 cooperative agreement is continuing on each species. Diaprepes (citrus and sugarcane root borer) research is being conducted in-house by ARS at Orlando at the $272,100 level in 1986.

37. Tropical/Subtropical Research. Recommends an appropriation of $735,000 for tropical and subtropical research programs under Section 406 of the Agricultural Trade Development and Assistance Act. This is the same amount as provided in 1985.

ARS is continuing in 1986 its component of the Section 406 Tropical Agriculture program. Two in-house projects are supported, one at Mayaguez, PR ($532,700) on genetic improvement of tropical crop germplasm. The other is at Hilo, HI ($166,600) on reduction of post-harvest losses of fresh tropical fruits in marketing channels.

38. Bee Research. Recommends funding at the fiscal year 1985 level.

ARS will continue in 1986 the honey bee research program at the same level as in 1985. The 1986 funding level is $3,420,000 as adjusted by the general reduction provided by Conference action and Gramm-Rudman sequestration.

39. Chalkbrood Syndrome. Expects that work on chalk brood syndrome will continue at the $100,000 level.

Chalkbrood research will continue at the $95,100 level as adjusted by the general reduction provided by Conference action and Gramm-Rudman sequestration. In past years, most of the funds have been expended via specific cooperative agreements with several Pacific northwest universities.

40. Heliothis. Expects the Department to work in consultation with the Environmental Protection Agency (EPA) to determine the appropriateness of providing a portion of the funding necessary to carry out a proposal to demonstrate the effectiveness of utilizing special electrical lighting, which has been suggested by GTE, the University of Georgia and others, to control the Heliothis complex, which includes tobacco budworms, pink cotton bollworms, and other pests.

ARS has had several meetings with GTE representatives and is now soliciting a formal proposal of their research plans and budgetary requirements. ARS will consider in consultation with EPA the appropriateness of funding a portion of this electrical lighting research to control Heliothis. At the present time, ARS does not consider this research approach very promising, based upon an analysis of past relevant research and the behavior/ migration pattern of this insect species.

41. United States-Hebrew University Tropical Animal Research Agreement. Interested in the possibility of a joint exotic foreign animal disease research agreement between an American and a foreign institution of higher learning. Such an agreement has the potential to add to the veterinary body of knowledge that would benefit all parties. Accordingly, the Committee directs the ARS to undertake a feasibility study regarding such a joint agreement.

An ARS committee has met to consider this issue. Committee members include representatives of ARS, APHIS, University of Florida, and University of California. ARS supports the concept of collaboration between domestic and foreign universities because of the opportunity to develop control technologies for potentially threatening exotic animal disease organisms. The Department can neither promote nor support a research agreement with Hebrew

University to the exclusion of other universities. The current budget situation prevents financial commitment from the Department for the United States-Hebrew University tropical animal research agreement.

42. Transfer. Within the funds for pay annualization, the Department should use $200,000 for the transfer to the Office of the Assistant Secretary for Science and Education for international scientific consultations on issues involving agricultural chemicals and food additives as they impact trade in agricultural products.

ARS has allocated $200,000 1986 funds for use by the Office of the Assistant Secretary to support scientific studies and consultations with Japan on commodity export and agricultural chemical residue issues.

43. Germplasm Collection Facility. Recommends $2,700,000 for construction of a germplasm collection facility in Aberdeen, ID. In 1985, the Committee provided $300,000 in planning funds for this facility. The Committee reiterates its view that Aberdeen is an ideal site for this facility, and, therefore, will expect no further construction on a similar facility at Beltsville, MD, until such time as a site selection and the planning has been completed for the facility at Aberdeen.

The conferees agree that the germplasm facility to be constructed at Aberdeen, ID, shall not duplicate the facility currently at Beltsville, MD, and shall work in cooperation with the Beltsville germplasm facility. Furthermore, the Conferees agree that no personnel, equipment, or other resources shall be transferred from Beltsville to Aberdeen to staff or equip this facility.

ARS is proceeding, in cooperation with the Idaho Agricultural Experiment Station, with the planning and design of a germplasm collection research facility at Aberdeen, ID. Design and construction estimated to require 2 years. The new facility will neither duplicate those at Beltsville, MD, nor will personnel and funds be transferred from Beltsville to Aberdeen. Placement of the existing and future small grain seed collection will be determined after clarification of Congressional intent.

44. Metabolism and Radiation Research Laboratory. Expects the Department to proceed with the construction of the Metabolism and Radiation Research Laboratory as directed in the 1985 Agriculture appropriations bill.

ARS is actively proceeding with the design of the new plant science research facility at Fargo. The final design is expected to be complete in March 1986. Construction bids will be solicited in April 1986. Estimated construction completion is August 1987. Total obligations will be $9.1 million.

45. Agricultural Science and Industry Facility. The Committee is interested in a proposal to establish an agricultural science and industry facility at Pennsylvania State University. Recommends $50,000 to conduct a feasibility study of the Pennsylvania State University proposal. Report to the appropriate committees of Congress by January 1, 1986.

The Associate Administrator of ARS will chair a committee made up of representatives from Pennsylvania State University, CSRS, and Industry to conduct a feasibility study of the University proposal. The Committee will meet in March 1986 and a final report will be available this summer.

46. Regional Veterinary School in Nebraska. Request a report not later than February 1, 1986, on the use of the funds appropriated in fiscal year 1984 for a regional veterinary school in Nebraska. The regional approach having failed, it is proposed that the funds be used for a clinical facility for training veterinary students from Nebraska and Kansas and for research in the areas of food processing, transportation and marketing systems.

The $12,050,000 appropriated to ARS in FY 1984 is still available. In addition, planning funds in the amount of $827,000 made available for that project in FY 1983 are available. A plan provided by the Conference Report proposed the funds be used for a clinical veterinary training facility and for research in food processing, transportation and marketing systems. The Department will implement the plan.

TECHNOLOGY TRANSFER

Dr. KINNEY. Finally, I want to mention technology transfer because it is so very important to all of agriculture, to all of our society.

I want to mention it from the standpoint of how complex it is and sometimes how long technology transfer takes. We talk about it very glibly. But sometimes we do not realize how long it takes for something to be adopted.

In the packet of materials that I gave you, there is a package of materials called LactAid. I provided this to you so that you would be aware of the fact that this is a product that, more than 10 years ago, our scientists at the Eastern Regional Research Center addressed. They had developed an enzyme system that would allow people who have a lactose intolerance to utilize milk or milk products. I was quite surprised when I found out that 75 percent of the adult population in the world has a lactose tolerance problem. It does not take much imagination to realize what an additional market we can open up for milk and milk products if we are able to solve that problem. But it has taken 10 years—the company is just now getting into the real accelerated phase of this product being adopted. I thought it was important that we become aware of how important technology transfer is and how complex it is too.

Mr. Chairman, I want to thank you and the members of the Committee for the good support that we have enjoyed from you, and the good direction that we have received from you.

Thank you.

Mr. TRAXLER. The Committee has read your full statement, and we appreciate your abbreviation of it.

OFFICE OF TECHNOLOGY ASSESSMENT REPORT

I was interested in "Technology Public Policy and the Changing Structure of American Agriculture" which was just published by the Office of Technology Assessment.

I just got it this morning, and I am not sure whether you have seen it yet or not. You saw it this morning also?

Dr. BENTLEY. Well, part of it yesterday.

Mr. TRAXLER. Well, if you have read the first two pages, you are ahead of me.

But one of the things that interests me is in reviewing their Advisory Panel, I note that they did not have anyone from the Department as part of their Advisory Panel.

Do you know whether or not they consulted with the people in your Department concerning the formation of their report and got information from them, or discussed it with them? It is a rather impressive panel, I do not want to take anything away from the Advisory Panel—but I think the report itself, from what I have read in the newspapers and my first page, it looks like it is going to be awfully interesting.

Did you have any input in this? Did they ask you any questions, to your knowledge?

Dr. BENTLEY. Mr. Chairman, I did not participate directly in response to a panel. I have talked with Mr. Phillips and others at various times about topics, some of which are related to this and some are not. I cannot tell you the names of all on the advisory

group, but I can add some, and perhaps some of my colleagues would have an opportunity to add to it.

But I know one on the Economics Panel and two of the people that served in an advisory capacity and had a lot to do with helping to write some of the sections, were from universities, one from Texas A&M University and one from Mississippi State University, people that both have had a long career in looking at matters such as the impact of technology on the changing farm structures. So they were very important to it.

Most of my exposure was visiting with them when they raised some of the questions. Now, the rest of the panel may be known to others here, but I do not happen to recall them right now.

Mr. TRAXLER. Well, I am sure that such interface that took place was probably by the staff people. You mentioned Mr. Phillips.

Dr. KINNEY. Mr. Chairman, I would like to interject.

The senior analyst, Dr. Yau-chi Lu, is an ARS employee, a very capable individual.

IMPACT ON SMALL FARMS

Mr. TRAXLER. I suspect there will be a considerable amount of debate as to some conclusions drawn from the information that they present. Some of it is awfully scary for those of us who might think of rural America as sort of the backbone of this country, because if one believes the report and the assumptions that we are going to have dramatically fewer farms and that the impact on small town America is simply going to be there—they are going to blow away, and that the mega farm is not going to be dependent upon the corner merchant for its services.

It is a rather profound implication for rural life, as we know it. I am not going to ask you to comment because I certainly can say no more about the report than what I just told you.

Dr. BENTLEY. I appreciate your not asking me to comment.

[Laughter.]

But if you will allow me to say that as I live and listen to the various changes throughout my career, which has been quite a long one now, I dealt as a college dean with these kinds of questions.

We have had statements and projections of this type that probably never come through, yet change does take place. There will be some changes made. We note though that the number of small farms generally is on the increase.

Mr. TRAXLER. Well, are you talking about 40 acres, 60 acres——

Dr. BENTLEY. It is the idea of the beholder.

Mr. TRAXLER. Well, you did an interesting yearbook a few years ago, 40 acres and independence sort of.

Dr. BENTLEY. Yes.

Mr. TRAXLER. And I imagine that was a best seller, that yearbook the Department put out.

Dr. BENTLEY. There are specialty areas, there is off farm employment, there is a combination of a person's life style that has an influence on this. In some areas of the country, I think we are going to see some emergence of smaller and medium-sized farms for various reasons or special reasons.

Perhaps in the grain farming areas, there might be further consolidation. I am, fortunately, old enough to remember the major change that took place in the thirties as a youngster in Great Plains. I thought that was so devastating to our family and the region that we lived in and we would not survive. Yet, it turns out that adjustments were made and part of my family still lives there.

TRANSFER OF INFORMATION

Mr. TRAXLER. Well, we certainly, since the First World War, are looking at decreasing numbers of farmers, and we have seen increased acreage, greater production. ARS and our whole agricultural research system and transfer systems that have played an amazing role in all of this.

Dr. BENTLEY. We take this, Mr. Chairman, as one of the major challenges to our Cooperative Extension Service. How do we assemble information, how do we get information to help people make decisions, whatever decisions they have to make, looking at new ways of carrying information, communications technology, getting different mechanisms to focus attention on some of these issues. I know that the Extension Service is giving a great deal of attention to this right now in anticipating changes, yet not knowing for sure what those changes will be.

RECOMBINANT DNA

Mr. TRAXLER. One of the cornerstones of the report that our Science Advisory Committee has done for us is they point out the importance in the coming years of recombinant DNA research and practical applications.

A few years ago, I badgered you a little bit about what you are doing and why you are not doing more in DNA. It was sort of when it was a no-no term and all kinds of problems were arising at Harvard at that time. We have seen some responses to events in California involving field experiments with DNA products.

How do you do it? What is going on in your agency with DNA? What do you do and what do you see in the private sector or in the research centers of the universities, the land grant universities in this regard?

Dr. KINNEY. I might, Mr. Chairman, indicate that in ARS we have high priority biotechnology research going on at over 40 different locations. But every bit of it we do is related to solving a problem.

There have been some recent articles in some leading magazines about the gap between basic and applied research, and it has narrowed down to the point where it is not even worth talking about any more. We are talking about solving problems. And some of the technology that at one time was so basic is now routine.

So we are addressing many, many issues, whether we are talking about animal diseases or plant production or animal production or whatever. Some of the fundamental research we are getting involved in that is again related to problem solving is the formation of the Plant Gene Expression Center in California. It is a cooperative venture with the University of California at Berkeley, with industry, with the experiment station system in California, and

through a consortium with anyone that it is important to cooperate with. The work is going to be geared toward defining or discovering how genes express themselves. We know that technicians can transfer genetic information from here to there pretty easily now.

But the problem is what happens to it once you transfer it. How do you turn it on or off or control it? So we are excited about it, but we do not think that it is just as critical that we move into this new technology as it was 30 or 40 years ago that we adopted the technology then. So it is kind of business as usual with us. We are going to pick up on it as quickly as we can.

Mr. TRAXLER. But it opens up some fascinating new avenues that, with your additional kinds of research and plant breeding just were not possible ever before. Imagine taking the broad characteristics of the pack list and putting it into the corn. That is going to be a mind busting technique.

Dr. KINNEY. That is going to take awhile.

Mr. TRAXLER. Mind boggling. But we can see it though. It is going to happen. You know it will take awhile.

I cannot make a positive statement about cancer in that fashion. I cannot say that the billions and billions of dollars we put into research are going to result in a cancer cure. I do not feel that comfortable. This is not the appropriate committee to discuss that. But I can tell you that the things that we imagine about recombinant DNA research are real and it is going to happen.

Dr. KINNEY. Mr. Chairman, two of the things, for example, that come to mind in the past year that have been developed by ARS, both at Beltsville utilized the new biotechnologies. One was the development of a vaccine for coccidiosis in poultry one of the oldest poultry diseases going which was developed through applied technology. The diagnostic procedure for the positive diagnosis of trichinosis is another one.

So things are going to happen very rapidly.

TECHNOLOGY

Mr. TRAXLER. Well, it is argued, and I think I will find it is argued in this report, that these giant steps forward are by American researchers. It is again going to put us in the fore of agriculture exports, that this technology is going to give us tremendous advantages.

I think that is interesting, but my question is, let us assume that we make gigantic steps forward within the next 10 years, let us assume that production goals are vastly exceeded, what is there that makes this kind of scientific research and product unique to the United States, and is it not technologically exportable and would it be exportable?

Dr. KINNEY. I think we are in the same position we have always been in the United States, where we have been one or two steps ahead of most countries in most of the technology, whether it is agriculture or industrial technology. By the time they caught up with us, we were two steps ahead. So we always had that advantage. We may only be one step ahead now. We are only a half a step ahead in many areas. So, again, I think it is a justification for continuing,

as I tell anyone I talk to. We are in a race with the rest of the world, and the prize is world markets.

Mr. TRAXLER. But one of the responsibilities that we have is as we try to assess the human impact of the advances in science, and one of the concerns I know that all my colleagues have on this Committee is what does the future hold for their farmers, for those families and for the small towns of America which are dependent upon the agricultural producers in those areas? Each of us in this Committee has many of those little communities, and they are an awfully important part of American life.

Just from some preliminary reading and the mass media, this report does not say some awfully encouraging things, good things about their future as they now see their future. So I guess that is our challenge on this side of the table, and you just keep doing the good work that you are doing.

Dr. KINNEY. I was just going to say, Mr. Chairman, I enjoy my job more and more all the time, and I do not envy those people like you and Dr. Bentley who have to establish policy that is going to make it logical.

Mr. TRAXLER. Or predict future events and design policy accordingly. We try to do that. Mostly we just respond.

I have got a couple of questions and then I am going to turn to Mrs. Smith. More back to business.

COOPERATIVE TROPICAL ANIMAL DISEASE PROGRAM

One of our colleagues on the Full Appropriations Committee has a special interest in the Cooperative Tropical Animal Disease Programs.

And you will remember that last year the Senate requested a feasibility study by ARS of a new research program on exotic foreign animal diseases between the Center for Tropical Veterinary Medicine at Koret School of Hebrew University in Israel and an appropriate American university.

Have you completed that study he would want to know, and have you released its findings?

Dr. KINNEY. Yes, it has been completed and, to my knowledge, it will be coming up to you soon.

Mr. TRAXLER. Do you include in your fund request for the '87 any monies to implement that kind of a program?

Dr. KINNEY. No, we have not.

Mr. Chairman, I might add that we have had a long standing close cooperation with Israel in the animal disease area and in all areas of research, and really through the Binational Agricultural Research and Development Program.

Through some direct cooperative work between the center and Hebrew University and other groups we are very positive about the opportunities for cooperation with Israel.

Mr. TRAXLER. I am sure Mr. Lehman will be pleased to hear that statement.

COOPERATIVE TROPICAL ANIMAL DISEASE PROGRAM

Dr. Kinney, last year the Senate requested a feasibility study by ARS of a new research program in Exotic Foreign Animal Diseases

between the Center for Tropical Veterinary Medicine at the Koret School of Hebrew University in Israel, and an American university. Can you tell us if you have completed that study and what its findings are?

Dr. KINNEY. A feasibility study was completed and the report has been provided to the Committee. In short, increased collaboration on research of foreign animal diseases between Hebrew University and American universities could be very beneficial to the U.S. livestock industries. Research could be conducted in Israel on certain diseases exotic to the United States.

Mr. TRAXLER. Can you tell us about previous research relationships between Hebrew University and ARS, and any existing relationships between Hebrew University and American Institutions?

Dr. KINNEY. Through the Bilateral Agricultural Research Development (BARD) agreement, the Agricultural Research Service has a cooperative agreement with Hebrew University on foreign animal diseases. Veterinary colleges and veterinary science departments in the United States are eligible to compete for BARD funds for collaborative and cooperative research with Hebrew University. There are a number of cooperative programs aimed at keeping abreast of certain foreign animal diseases and doing research on diagnostic and control methods at several overseas locations. These are carried out through a variety of funding mechanisms and involve several universities including the University of Florida. While we do not have a detailed description of the additional facilities Hebrew University would need for this type of research, a cooperative program would require appropriate biocontainment facilities for research, teaching, and training programs in selected animal diseases. Such facilities are costly to construct.

Mr. TRAXLER. Can you tell me if the study recommends additional facilities for the center in Israel and what the cost of these facilities might be?

Dr. KINNEY. Our study simply addressed the feasibility of potential increased collaboration between Hebrew University and an American university on research of foreign animal diseases. We did not recommend, but rather noted that Hebrew University would require additional facilities for biocontainment of foreign animal diseases.

Mr. TRAXLER. Are any funds requested for this project as part of your fiscal 1987 request?

Dr. KINNEY. ARS does not have funds available to support this project and has not requested funds for this project for FY 1987. Since ARS is the in-house research arm of USDA, it would not be appropriate for ARS to fund this type activity. ARS will continue to cooperate with Hebrew University on research as part of the BARD agreement and, perhaps, in other areas of research within the mission and appropriate role of ARS.

Mr. TRAXLER. Would you submit any additional information on this project for the record that you believe would help us more fully understand what you are trying to do.

Dr. KINNEY. USDA does not have any planned new initiatives for cooperative or collaborative agreements with Hebrew University on foreign animal disease research at this time. ARS was requested by the Senate Appropriations Committee to assess the feasibility for

cooperation between Hebrew University and an American university.

FOOD TOXICOLOGY RESEARCH

Mr. TRAXLER. Would you once again tell us what work you have been conducting with food toxicology research? Michigan State University has been involved with a contract with you for some time. Please include references to work being done to implement the recommendations of the report on food toxicology research that was completed two years ago.

Dr. KINNEY. In accordance with Congressional recommendations, ARS has been supporting studies at Michigan State University for the continued assessment of dioxin contamination in the Great Lakes food chain and agricultural production system. These studies have made significant progress in developing microbial systems to degrade dioxin by dechlorination and ether cleavage, and understanding the biological activity of dioxins as promotors or enhancers of hepatocarcinogenesis. Other studies have looked at the use of triple quadrupole mass spectrometry for dioxin residue analysis and at the interaction of Vitamin A, thyroxine and dioxin particularly in the growth and survival of trout. We continue to use the report, Role of the United States Department of Agriculture in Food Toxicology Research, in helping to determine the direction of our food safety program. In particular, we are developing methods to control and prevent the formation of mycotoxins in foods and feeds by delineating the ecological relationship of fungus and crop during both production and harvesting and the biochemical parameters of mycotoxin elaboration in the crop. We are also defining both the specific toxic effects and the interactions of mycotoxins in animals and we are developing analytical methods to quickly and economically identify the toxins in agricultural commodities. In other ARS programs we are investigating the mechanism of action of toxins of plant origin such as those from locoweed and pine needles, and trypsin inhibitor from soybeans to form the basis for effective control methods. In the area of microbiology we are examining methods to assure the microbiological safety of meat and meat products.

BELTSVILLE IMPROVEMENTS

Mr. TRAXLER. I have been hearing that there is a growing need to improve the quality of the research facilities at Beltsville. This goes beyond the replacement of the animal facilities that were destroyed by fire. First, can you describe the precise needs at Beltsville, including the total cost of providing these improvements?

Dr. KINNEY. The Beltsville Agricultural Research Center was established in 1910. Almost all of the major facilities of the Center were constructed prior to World War II. Thus, there is an urgent need to make center-wide improvements including road and parking lot resurfacing, replacement or repair of roofs, and of heating, ventilating and air-conditioning systems, renovation of laboratories, etc.; provide state-of-the-art research instrumentation; and construct some modern research facilities.

On October 1, 1985, we developed a fairly comprehensive 8-year plan—Renaissance 93—for restoring and upgrading the Research Center. The cost for needed repairs and maintenance, energy retrofit, renovation, new construction, and research equipment, is estimated at $162 million. The Agency has not developed a comprehensive financial plan to accomplish the upgrading.

Mr. TRAXLER. What portions of these improvements are being carried out in fiscal 1986, and are included in your request for fiscal 1987?

Dr. KINNEY. By the end of FY 1986, we will have met about 4.3 percent of the needs identified in the Renaissance 93 plan.

[Additional information follows:]

Efforts currently underway to meet the needs identified in the plan are as follows:

Energy retrofit projects	$1,556,000
Repair and maintenance projects	1,380,000
Renovation	3,061,000
Scientific equipment	263,430
Total	6,260,430

It is likely that we will be able to meet an additional 3-4 percent of the needs of FY 1987.

Mr. TRAXLER. What was your original request when ARS developed its budget for improvements at Beltsville?

[The information follows:]

In our initial FY 1987 budget estimates we requested the following amounts for planning, design, and construction:

Animal Facility for Human Nutrition Research, Beltsville, Maryland	$2,000,000
Plant Introduction/Containment Research Facility, Beltsville, Maryland	4,000,000

POTATO RESEARCH

Mr. TRAXLER. I have been hearing more from potato growers in my area about the needs they have for potato research. I know that there are regional funds available in the CSRS budget. Can you tell me what ARS is doing with potato research and specifically what work may be being done on potato scab research?

[The information follows:]

We have research on potatoes at 13 locations with emphasis in the following areas: Genetics and cytogenetics; evaluation of exotic potato germplasm for important horticultural characteristics; breeding for disease and insect resistance, increased yields, nutritional quality, and consumer acceptance; germplasm preservation and maintenance; protoplast fusion and other genetic engineering techniques for transfer of genetic material; genetic variation in plants from tissue culture; physiology of plant growth and use of bioregulating compounds; effect of plant stress on growth, yield, and nutritional quality of potatoes; prediction of potato quality in bulk storage facilities; physical properties associated with quality of processed potatoes; food processing; nature of host plant resistance to major diseases and other pests; biology and control of golden and root-knot nematodes; biological control and integrated pest management of potato insects, diseases, and nematodes; and identification and control of disease and insect pests. There is research on potato scab disease at Prosser, Washington; Aberdeen, Idaho; and Beltsville, Maryland—the locations where we have potato breeding programs. Breeding for disease resistance is a major objective and most of the new varieties released have good resistance to scab.

SUGARBEET AND BEAN RESEARCH

Mr. TRAXLER. Would you once again update the record on what you are planning to do with sugarbeet and dry bean research by location, and summarize any of your accomplishments this year?

Dr. KINNEY. Emphasis of sugarbeet research is on germplasm evaluation and enhancement; development of new germplasm lines with improved tolerance to pests and environmental stress factors; in vitro propagation and preservation of sugarbeet germplasm; genetic studies on growth, heterosis, and quality factors; biology and control of insect and disease pests; ecology, biology and management of nematodes; reduction of postharvest losses; integration of weed management systems; and separation and purification of sucrose from sugarbeets.

The estimated level of funding for sugarbeet research in fiscal year 1986 is $3,152,800 and $3,294,500 for fiscal year 1987.

[Additional information follows:]

Funds by location for fiscal year 1986 and 1987 are:

Location	1986 estimate	1987 estimate
Salinas, CA	$1,010,100	$1,055,500
Ft. Collins, CO	585,900	612,200
Tifton, GA	50,300	52,600
Ames, IA	52,800	55,200
Beltsville, MD	366,100	382,600
East Lansing, MI	387,800	405,200
Fargo, ND	416,700	435,400
Logan, UT	283,100	295,800
Total	3,152,800	3,294,500

There are several accomplishments from ARS sugarbeet research programs. Last year, 25 new germplasm lines were introduced which can be used by private industry to introduce new commercial varieties. These lines introduce genes for improved yields, pest resistance, and tolerance to environmental stress factors. We have initiated research on rhizomania. a new disease in California, and have found sources of resistance to this serious disease. Research on storage of sugarbeet pollen has shown that it can be successfully stored for at least one year at minus 196 degrees C. This information will help sugarbeet breeders preserve genetic material and exchange pollen needed for cooperative programs.

Primary emphasis of dry bean research is on germplasm evaluation; germplasm enhancement for resistance to pests, resistance to environmental stress factors, and for improved nutritional and culinary quality; genetics of economically important characteristics; disease control; role of nondigestible constituents of dry beans in digestion and absorption of nutrients.

The estimated level of funding for dry beans research in fiscal year 1986 is $877,300 and $1,066,700 for fiscal year 1987. Funds by location for fiscal years 1986 and 1987 are:

Location	1986 estimate	1987 estimate
Albany, CA	$138,200	$144,400
Akron, CO	10,100	10,600
Beltsville, MD	78,900	82,400
East Lansing, MI	230,300	240,600
Mayaguez, PR	284,300	297,100
Logan, UT	2,600	2,700
Prosser, WA	132,300	288,900
Total	877,300	1,066,700

There are several recent accomplishments from ARS research on dry beans. Knowledge on the genetics of resistance of beans to bean rust disease now enable commercial bean breeders to introduce resistant varieties. Six germplasm lines were recently introduced which can be used as parents and Laker, a new disease-resistant variety jointly introduced with Michigan, was also introduced. A combination of cultural practices and timing of sprinkler irrigation were found to reduce incidence of bean root rot and white mold bean disease problems in Northwestern production areas.

PICKLE, ONION, AND CARROT RESEARCH

Mr. TRAXLER. Could you also update us on your research program for pickles, onions, and carrots, by location for fiscal 1986 and 1987?

[The information follows:]

Emphasis on pickle research is on germplasm evaluation, gene enhancement, germplasm and variety development, integrated pest management systems, obtaining efficacy data on insecticides, and improved methods of fermentation for commercial production of pickles. Onion research is on cytogenetics and gene transfer systems, germplasm evaluation and enhancement, evaluation of herbicides and presence of allelopathic compounds, registration of chemicals on minor acreage crops, biology and control of insect pests, and development of non-destructive measurements of quality. Emphasis on carrot research is on germplasm evaluation and enhancement, development of improved germplasm lines and improved varieties, pollination studies on cytoplasmic male hybrid seed parents, and tissue culture research.

The estimated level of funding for pickle, onion, and carrot research in fiscal year 1986 is $1,717,500 and $1,944,600 in fiscal year 1987. Funds by location for fiscal years 1986 and 1987, respectively, are:

Location	1986 estimate	1987 estimate
Athens, GA	$107,900	$112,700
Tifton, GA	12,400	13,000
Peoria, IL	61,300	64,100
Beltsville, MD	200,700	209,700
East Lansing, MI	6,000	6,300
Raleigh, NC	376,900	393,800
Lane, OK	76,100	79,500
Wyndmoor, PA	13,400	14,000
Charleston, SC	292,100	455,200
Weslaco, TX	147,100	153,700
Pullman, WA	20,500	21,400
Madison, WI	403,100	421,200
Total	1,717,500	1,944,600

ARS AND LAND GRANT COLLEGES

MR. TRAXLER. Dr. Kinney, you are the only beneficiary of increased funding within the research entities of USDA. Cooperative Research faces frozen formula funding again, as well as the termination of a number of special research projects. While some land grant colleges have been able to withstand the reduced levels of funding, and others have been fortunate enough to obtain increases from State governments, this isn't always the case, nor can it be expected to continue.

If CSRS funding is not increased, land grant colleges may face difficulties in continuing the quality of their operations. I know that you work in close partnership with them. What does their budget say about your future? Will you have to pick up more research work or add to your facilities if they are unable to maintain their base?

Dr. KINNEY. The State-Federal research partnership is important to ARS. The proposed reduction in the CSRS budget could indirectly affect a portion of ARS programs if support for land-grant university facilities and some collaborating scientist projects are impacted negatively. At this time, ARS does not foresee a need to expand our facilities, but funding adjustments in some programs may be necessary. ARS will consider these potential impacts on a case-by-case basis and allocate available resources to the highest priority problems and needs.

Dr. BENTLEY. Mr. Traxler, before you go, could I just make one additional comment.

I would like to correct an oversight on my part. I did not introduce Mike Hoback, who is my colleague who works with many members of your staff right here. I just wanted to be sure to recognize him.

Mr. TRAXLER. You are reaching down now where you are getting the real workers.

Dr. BENTLEY. Yes. That is why I thought about that.

[Laughter]

Mr. MYERS. As he says, he works with the staff and not the members.

[Laughter]

RURAL AMERICA

Dr. BENTLEY. I share your concern about the development in rural America, and I think we ought to be concerned about it not only from an agricultural point but for the services that agricultural people who live in rural America need such as, education and transportation. And we think that we offer it in our Extension programs. We can be the catalyst for getting at least a discussion and the encouragement to get people together to work at these and look at these problems and find ways to live with them.

I know that it would be easy to come up with some panacea or some answer, but there are not very many easy answers, and I think we need to do that.

But one thing we can do is to be sure we have a healthy agriculture so we can be competitive there too.

Mr. TRAXLER. And a healthy Cooperative Extension Service.

That is an eloquent statement in support of funding for Cooperative Extension. We all appreciate that.

RESEARCH PRIORITIES

Mr. WHITTEN. According to your testimony, you are proposing to address current problems of surplus commodities and decreasing export potential by providing the research necessary to develop new agricultural products and to penetrate new export markets. Please provide for the record, in general terms, a few examples of

new products that can be manufactured with existing commodities, the market potential, and when we might expect to see the benefits of such research.

[The information follows:]

Development of new agricultural products is focused primarily on the opportunities inherent in the use of the new biotechnologies to compete in the industrial products arena with petroleum and to devise the means to reduce those agricultural products imported in significant quantity. Selected examples of these products are:

Substitution of starch products for petroleum in plastics production offers a 50 million pound annual market. Projected market for agricultural films made biodegradable through the introduction of starch from corn or wheat is estimated at 43 million pounds alone. Initial benefits in replacing nondegradable agricultural mulch films could be anticipated in 3 to 5 years.

Genetic engineering of the soybean to retain the agronomic characteristics of the old crop but creating a new market by changing the fatty acid composition to one of a major import commodity, namely lauric acid, used in the manufacture of soaps and detergents, has a longer range payoff of 8 to 12 years.

New nonwoven products from cotton including industrial and consumer "waste wipes" or towel nonwovens could meet needs in a rapidly expanding 1.5 billion pound annual market within a timeframe of 5 to 10 years.

Development of lactose free milk products that can be concentrated into shelf-stable products requiring no refrigeration and into cholesterol-free butter oil are two examples of unique products that could penetrate and open new export markets. Accomplishment of these objectives should be attainable in the next 5 to 8 years.

Elimination of trade barriers through improved assessment of critical quality factors in peanuts and new technology for fumigation of fruits is another way in which export markets can be expanded. These approaches should be achievable in 3 to 5 years.

Mr. WHITTEN. How were these priorities established? Did they develop through coordination with the Foreign Agricultural Service and other organizations responsible for assessing foreign market potential?

Dr. KINNEY. These priorities and opportunities were identified and established through close cooperation and coordination with USDA agencies such as FAS, ERS, APHIS, and AMS, as well as other organizations representing specific commodities such as the National Peanut Council.

1987 BUDGET PRIORITIES

Mr. WHITTEN. Are the priorities consistent with the most recent ARS six-year implementation plan?

Dr. KINNEY. Yes, the 1987 budget request for commodity conversion and delivery is highly consistent with the most recent ARS six-year implementation plan. This plan specifically identifies declining exports, reduced price competitiveness, and increasing surpluses of many commodities as major problems facing U.S. agriculture. Accelerated research to improve quality, develop new uses, and remove technical barriers to export of agricultural products are among the highest of all research priorities.

Mr. WHITTEN. Is the fiscal year 1987 budget request consistent with the ARS planned program balance?

Dr. KINNEY. Yes, the 1987 budget request is consistent with the ARS planned program balance. The $10,000,000 request for commodity conversion increases the balance of programs addressing problems of declining prices and exports and increasing agricultural commodity surpluses. The additional $3,492,000 request for plant

productivity addresses problems of farm profitability through the application of new, promising biotechnology research tools to the development of crop germplasm for improved crop growth and yield, product quality, and biological resistance of pests and environmental stresses.

Mr. WHITTEN. You also cite as a research objective the need to increase production efficiency as opposed to increasing production. For the record, please provide a few examples of the research to increase production efficiency that is currently underway and that is planned.

Dr. KINNEY. We are emphasizing research which will reduce unit production costs of major farm commodities and improve their competitiveness in world markets.

[Additional information follows:]

1. Scientists at Mississippi State are modeling the growth of the cotton plant and its response to temperature, light, water, and fertilizers. Pilot tests by a grower utilizing this model to help make management decisions indicated savings of over five cents per pound in the cost of producing cotton.

2. A new kind of soybean selected at Urbana, Illinois, for chicken and swine feed may save farmers and processors up to 50 cents per bushel. The new strain lacks a protein found in most soybeans that, when eaten by an animal, inhibits trypsin—an important digestive enzyme. Because of this protein, most beans are normally digested well only if crushed and cooked into processed meal. The new experimental varieties would require less cooking and processing.

3. Pecan growers can save thousands of dollars in pesticide costs and still control major insect pests by using an ARS biocontrol system developed by scientists at Byron, Georgia. The new system kept one of Georgia's largest pecan orchards nearly free of insect pests in 1985. The orchard was planted in vetch and arrowleaf clover which aided the reproduction of beneficial insects—lady beetles and lacewings—that attack pecan aphids and mites.

4. The boll weevil, which for decades has attacked cotton crops in the South, virtually has been eradicated in North and South Carolina. In December 1985 the Animal Plant Health and Inspection Service, using technology developed by ARS scientists, completed a program to eliminate the pest on 220,000 acres of cotton. An economic evaluation in an eradicated area found that cotton insecticide expenditures following the program dropped from an average of $51 per acre to $17 per acre.

We plan to expand gene transfer and germplasm enhancement research in 1987 which will reduce genetic vulnerability of economic crop plants to pests and environmental stress. The resulting new varieties with built-in resistance to diseases, insects, drought, and cold will improve our capacity to produce quality products at lower unit costs.

FISCAL YEAR 1987 BUDGET REQUEST

Mr. WHITTEN. Please submit for the record a table showing, by program, the agency's fiscal year 1987 budget request to the Assistant Secretary, the Assistant Secretary's recommendations to the Secretary, the Secretary's recommendations to OMB, and the OMB allowance.

[The information follows:]

FISCAL YEAR 1987 RECOMMENDATIONS

	Agency	Department	Budget
Soil and water conservation:			
Ground quality	$3,000,000	$3,000,000	
Control salinity and toxic elements in irrigation and drainage waters of the West	1,000,000	700,000	
Soil erosion prediction and control	2,000,000	1,400,000	

FISCAL YEAR 1987 RECOMMENDATIONS—Continued

	Agency	Department	Budget
Dryland agricultural cropping systems	2,000,000	1,400,000	.....
Improved nitrogen fixation and fertilizer management	1,000,000	700,000	.....
Plant productivity:			
Crop germplasm evaluation and maintenance	2,500,000	2,500,000	$1,500,000
Gene transfer and germplasm enhancement	4,500,000	3,350,000	1,992,000
Heliothis population suppression on area-wide basis	1,500,000	1,000,000	.....
Protect crops from exotic and domestic pests with biocontrol and new bioregulatory approaches	2,500,000	1,800,000	.....
Improve crop root health	1,000,000	709,000	.....
Animal productivity:			
Improve methods for animal disease diagnosis	4,000,000	2,877,000	.....
Reduce fat in living animals and poultry	2,000,000	1,400,000	.....
Disease transmission in embryos	1,000,000	700,000	.....
Genetic resistance to Disease	2,000,000	1,400,000	.....
Commodity conversion and delivery:			
Develop new and value-added dairy products (food and non-food)	1,500,000	1,500,000	1,500,000
Develop new and value-added products from corn, wheat, cotton and soybeans (food and non-food)	3,000,000	3,000,000	3,000,000
Reduce losses and remove barriers to commodity exports	4,500,000	3,000,000	3,000,000
Develop new lightly processed fruit and vegetable products	3,500,000	2,500,000	2,500,000
Human nutrition:			
Role of animal and plant sources of dietary fat in human nutrition	3,000,000	2,100,000	.....
Role of dietary fiber in human nutrition	2,000,000	1,400,000	.....
Integrated agricultural systems:			
Wheat production system for improved efficiency and quality—cost reduction	1,000,000	700,000	.....
Rangeland grazing systems for production and utilization efficiency	1,500,000	1,000,000	.....
Total recommended research increases	50,000,000	38,136,000	13,492,000
BUILDINGS AND FACILITIES			
Planning, design and construction of:			
National Seed Storage Laboratory, Ft. Collins, CO	19,600,000	19,600,000	.....
Animal Facility for Human Nutrition Research, Beltsville, MD	2,000,000	2,000,000	.....
Crop Export and Water Management Research Facility, Fresno, CA	17,000,000	.....	.....
Poultry Disease Laboratory, Athens, GA	2,500,000	2,500,000	.....
Plant Introduction/Containment Research Facility, Beltsville, MD	4,000,000	.....	.....
Yakima Agriculture Research Laboratory, Yakima, WA	8,000,000	.....	.....
Total, Buildings and Facilities	53,100,000	24,100,000	.....

STAFF YEAR INCREASES

Mr. WHITTEN. According to explanatory notes ARS is increasing its total staff year ceiling by 60 staff years. Will the additional staff be assigned to field locations? Please provide for the record a list of field offices receiving additional personnel and a general description of the type of research they will be engaged in.

Dr. KINNEY. All of the additional staff will be assigned to field locations. The additional ceiling will be allocated to the new thrusts proposed in the 1987 Budget for plant germplasm and commodity conversion and delivery.

Germplasm evaluation.—Evaluation research will identify the desired genetic diversity in our germplasm collections, provide basic information on what diversity exists and how it is distributed within the collections.

Gene transfer and germplasm enhancement.—Research will be conducted to develop strategies and technologies required for the

efficient, precise, and operative transfer of desired genes into economically important crop plants.

New and value-added dairy products (food and nonfood).—Research to develop biotechnologies to convert milk components to new food forms and value-added chemicals, and to eliminate impediments in current domestic and export markets, such as cholesterol and lactose.

New and value-added products from corn, wheat, cotton and soybeans (food and nonfood).—Research on technologies to include utilization of microbial and enzyme engineering to carry out chemical reactions essential to conversions.

Reduce losses and remove barriers to commodity exports.—Research will address both animal and crop commodity problems including quality issues and action agency priorities.

New lightly processed fruit and vegetable products.—Research to develop methods to provide lightly processed fruits and vegetables which meet buyer's quality demands, safety standards and shelf-life needs.

[Additional information follows:]

Resources are proposed to be implemented at the following locations: Stuttgart, Arkansas; Albany, California; Fresno, California; Miami, Florida; Winter Haven, Florida; Athens, Georgia; Dawson, Georgia; Experiment, Georgia; Savannah, Georgia; Honolulu, Hawaii; Peoria, Illinois; Urbana, Illinois; Ames, Iowa; Manhattan, Kansas; New Orleans, Louisiana; Beltsville, Maryland; Mississippi State, Mississippi; Stoneville, Mississippi; Columbia, Missouri; Clay Center, Nebraska; Lane, Oklahoma; Wyndmoor, Pennsylvania; Charleston, South Carolina; College Station, Texas; Weslaco, Texas; and Prosser, Washington.

CURRENT RESEARCH PROGRAMS

Mr. WHITTEN. For the record, please list the various research programs, including the special research programs currently conducted by ARS, showing the amount of the resources devoted to each for fiscal years 1985, 1986, and 1987.

[The information follows:]

RESEARCH PROGRAMS BY OBJECTIVE

[In thousands of dollars]

Objective/approach	FY 1985 estimated	FY 1986 estimated	FY 1987 estimated
1. Soil and water conservation:			
1. Assessment technology	$9,362	$7,369	$7,700
2. Land	20,610	20,150	21,055
3. Water	22,576	24,714	25,825
4. Systems	6,955	7,176	7,498
Total, soil and water conservation	59,503	59,409	62,078
2. Plant productivity:			
1. Germplasm	24,377	19,868	22,610
2. Modify germplasm	41,209	42,270	45,811
3. Production/quality	39,825	39,630	41,411
4. Protection	80,792	82,985	86,714
5. Systems	1,877		
Total, plant productivity	188,080	184,753	196,546
3. Animal productivity:			
1. Genetics	9,833	6,208	6,487

RESEARCH PROGRAMS BY OBJECTIVE—Continued

[In thousands of dollars]

Objective/approach	FY 1985 estimated	FY 1986 estimated	FY 1987 estimated
2. Reproduction	7,678	8,239	8,609
3. Nutrition	12,024	11,589	12,110
4. Disease	43,082	43,100	45,037
5. Insects, ticks and mites	11,875	13,142	13,733
6. Systems	4,442	5,498	5,744
Total, animal productivity	88,934	87,776	91,720
4. Commodity conversion and delivery:			
1. Quality	51,062	49,956	59,701
2. Safety	20,133	18,107	19,471
3. Loss reduction	16,263	17,088	19,256
4. Systems	3,696	3,876	4,599
Total, commodity conversion and delivery	91,154	89,027	103,027
5. Human nutrition:			
1. Nutrient requirements	26,417	27,462	28,696
2. Nutrient composition and bioavailability	7,865	6,870	7,179
3. Nutrient status evaluation	2,241	3,104	3,243
4. Integration	290	326	341
Total, human nutrition	36,813	37,762	39,459
6. Integration of systems:			
1. Integrated systems	8,842	7,850	8,203
2. Alternative systems	1,604		
Total, integration of systems	10,446	7,850	8,203
7. Repair and maintenance of facilities	11,092	10,552	11,026
8. Contingencies	1,000	951	994
Total	487,022	478,080	513,053

SPECIAL RESEARCH PROGRAMS

[In thousands of dollars]

	FY 1985	FY 1986	FY 1987
SRP:			
Energy	$15,471	$12,902	$13,481
Remote sensing	5,495	5,703	5,959
Pilot test funds	1,646	1,223	1,278
Narcotics	1,437	1,367	1,428
Minor use pesticides	1,170	1,113	1,163
Plant exploration	40	53	55

RESEARCH ACCOMPLISHMENTS

Mr. WHITTEN. Please provide for the record copies of the four quarterly reports on research accomplishments for fiscal years 1985, 1986, and 1987.

[The information appears on pages 500 through 567.

OBLIGATIONS FROM OTHER USDA APPROPRIATIONS

Mr. WHITTEN. Please provide for the record a description of the research being conducted for other USDA agencies in fiscal year 1987, the expenditures for that research, and the location at which the research is being conducted.

[The information follows:]

ARS is estimating the level of expenditures received from other USDA agencies for services and research for FY 1987 as being approximately the same as the actual level in FY 1985. The information follows:

	Amount	Location
Agricultural Marketing Service [EAP counseling, Duplicating service, Space rental and Other Services, Automated high-volume instruments for measuring cotton fiber properties].	$115,468	Beltsville, MD; Washington, D.C.; Clemson, SC.
Animal and Plant Health Inspection Service [Monitoring effects on Medfly of malathion bait spray, Pseudorabies, Pathogenesis and transfer of tuberculosis in bison, Susceptibility of bison to infection with brucella, Bark and ambrosia beetles, Citrus Whitefly, Barberry testing, Biocontrol-Alfalfa weevil, EAP counseling, Space rental and Other Services].	5,345,076	Beltsville, MD; Hyattsville, MD; Orient Point, NY; Newark, NJ; St. Paul, MN; Baton Rouge, LA; Pullman, WA; Weslaco, TX; Byron, GA; Miami, FL; Ames, IA; Honolulu, HI.
Forest Service [Design a HVAC mechanical system, Radiological safety service, Flume designed and constructed, Employment examination and advertisement for senior level positions, Space rental and Other Services].	152,948	Beltsville, MD; College Station, TX; Tucson, AZ; Washington, D.C.
Food Safety and Inspection Service [Carrying out a portion of the Total Residue Avoidance Program, EAP counseling, Space rental and Other Services].	1,434,683	Clay Center, NE; Athens, GA; Ames, IA; Washington, D.C.; Beltsville, MD.
Federal Grain Inspection Service [Grain moisture measurement studies, Equipment for Toxic weed monitoring, Space rental and Other Services].	263,475	Beltsville, MD; Albany, NY.
Soil Conservation Service [Photogrammetric activities, Watershead data, Hydro/ecosystems, Snow hydrology, Development of an organic matter equilibrium mode, Soil loss caused by seasonal ephemeral gullies, Natural resource inventory data analyses, Impact of frost on glacial till, EAP counseling, Space rental and Other Services].	607,588	Washington, D.C.; Watkinsville, GA; Mayaguez, PR; Beltsville, MD; Fort Collins, CO; Boise, ID; Oxford, MS; St. Paul, MN; Mandan, ND.
Cooperative State Research Service [Enzymatic action in the mode of entry of nomuraea, Plant viroid replication and host interaction, Peptide conjugate of IAA from phaseolus, Cloning and expression of genetic basis for disease resistance, Disease resistance in genetically engineered swine, Nitrate metabolism with nodulation of soybeans, Bioengineering avian herpes virus, Gene transfer to the germline of chicken, Gene and gene products of oncogenic Marek's disease, Analysis of chicken MHC class II genes, Genetic diversity of sexual and asexual rust fungus, Plant-bacterial interactions during legume root, Race-specific incompatibility in powdery mildew, Homologuous pairing genes, Use of isotopes to determine dietary requirements, Methods for germplasm enhancement in corn, Genetically engineered line oral pilus vaccine, Insect control manipula cuticle destabilize enzymes, RNases synthesized during floral development, Control of photosynthetic sucrose formation, Control mechanisms for photosynthate partitioning, Isozyme loci markers locate and manipulate trait loci, Diversity publications, Symposa-American Society for Animal Science].	724,454	Washington, D.C.; Beltsville, MD; Ames, IA; Manhattan, KS; Columbia, MO; E. Lansing, MI; St. Paul, MN; Fargo, ND; Logan, UT; Raleigh, NC; Athens, GA.
National Agricultural Library [Administrative services]	502,139	Beltsville, MD.
Human Nutrition Information Service [Nutrient analysis for food, EAP counseling, Space rental and Other Services].	102,351	Beltsville, MD; Hyattsville, MD.

	Amount	Location
Office of International Cooperation and Development [Prosopis species leguminous crop, Biosythesis of wheat proteins, Soil moisture, Wheat in Peru, Indo-U.S. science and technology initiative, Fire ant, Migration of heliothis an spodaptera, Plant and seed material RSSA, World Rhizobium collection, Freezing and preservation of semen in swine, Immunity in parasites, Spiroplasm diagnosis, Tsetse fly, Eradication of tropical ront tick from Puerto Rico, Etiology of cereal Yellow Dwarf, Selection and evaluation of trifolium germplasm, African swine fever study, EAP counseling, and Other Services].	504,918	Beltsville, MD; Washington, D.C.; Greenport, NY; Manhattan, KS; Columbia, MO; Lincoln, NE; W. Lafayette, IN; Morris, MN; Albany, CA; Phoenix, AZ; Fort Collins, CO; College Station, TX; Kerrville, TX; Mississippi State, MS; Stoneville, MS; Orlando, FL; Tifton, GA; Mayaguez, PR.
Other USDA Agencies; Economic Research Service, Extension Service, Farmers Home Administration, Federal Crop Insurance Corporation, Foreign Agricultural Service, Office of the Inspector General, Office of Personnel, Office of Transportation, Statistical Reporting Service, World Agricultural Outlook Board [Develop a model to simulate soil productivity effectiveness, Automate detection of hard wheat, Soybean crop growth simulator and data, Acquisition of satellite data (Landsat), EAP counseling, Employment examinations and advertisement for senior level positions, and Other Services].	375,744	Temple, TX; Lincoln, NE; Beltsville, MD; Urbana, IL; Morris, MN.
Total	10,128,844	

OTHER FEDERAL FUNDS

Mr. WHITTEN. Please provide for the record a description of the research being conducted for non-USDA agencies in fiscal year 1987, the expenditures for that research, and the location of that research.

[The information follows:]

ARS is estimating the level of expenditures received from other agencies for services and research for FY 1987 as appoximately the same as the actual level in FY 1985. The information follows:

	Amount	Location
Department of Commerce [Satellite remote sensing technique]	$300,000	Weslaco, TX.
Environmental Protection Agency [Salmonella sludge, Southeast Regional crop loss, Space rental and Other services].	775,422	Beltsville, MD; Raleigh, NC; Athens, GA.
Department of Interior [Development of soil probe, Irrigation management, Livestock grazing on surface mined land, Upgrade and modify flow model, Aerial survey, Park Service air quality, Process precipitation charts, Utility costs, Space rental and Other Services].	185,377	Beltsvile, MD; St. Paul, MN; Riverside, CA; Salinas, CA; Reno, NV; Boise, ID; Fort Collins, CO; Woodward, OK; Weslaco, TX; Raleigh, NC.
Department of Energy [Studies on regulation of gene expression in soybean cotyledono using the B-subunit of 7S storage protein as a model system, Spent fluidized bed material, Radiation of fruits and nuts, Evaluate operation of low-pressure irrigation, Wind energy, Solar drying crops, Biomass as energy source and Oil seed crops as a fuel substitute].	600,553	Ithaca, NY; Beckley, WV; Fresno, CA; Kimberly, ID; Bushland, TX; Tifton, GA.
Department of Health and Human Resources [Animal feed, Human studies of diet and nutrition, Nutrient content in foods, Polypeptide hormone, Apoprotein measurements, Storage and blood tissue samples, Guide for safe handling of hazardous biomaterials, Evaluate mouse erythrocyte micronucleus assay, Phorbal, Space rental and Other Services].	2,071,299	Beltsville, MD; Boston, MA; Albany, CA.

	Amount	Location
Department of Defense [Evaluation of plant bioassay process, Chemicals in ground maintenance, Work shops and integrated management, Guayule seed quality, Guayule rubber, Maintenance of military cemetery, Water quality research on Lake Chicot, AR—flame retardant cotton fabrics, Pest control in Alaska, Repellents for Central American malaria, Anopheles freeborni studies, Field and laboratory testing of clothing, Mycotoxins in vitro, Chemical control of aquatic weeds, Hydrilla, Workgroup meeting and West Point cadets nutrient intake evaluation studies].	736,516	Beltsville, MD; Phoenix, AZ; El Reno, OK; Durant, OK; New Orleans, LA; Savannah, GA; Gainesville, FL; Athens, GA; Fort Lauderdale, FL; San Francisco, CA.
Other Non-USDA Agencies: Department of Justice, Department of State, General Services Administration, Central Intelligence Agency, National Science Foundation, Consumer Products Safety Commission [Plant diseases which pose threats/foreign countries, Microbial control agents of mosquitoes, Evaluate potentially toxic textile dyes, Duplicating services and Space rental].	187,733	Beltsville, MD; Frederick, MD; Athens, GA.
Total	4,856,900	

UNOBLIGATED BALANCES

Mr. WHITTEN. According to the explanatory notes, ARS has an unobligated balance of $3.4 million in FY 1985. What are the reasons for the unobligated balance.

Dr. KINNEY. When viewed in the context of the Agency's total appropriation—$497.9 million—the unobligated balance represents only .69 of 1 percent. This small percentage is significantly below the average unobligated rate for the past five fiscal years and is all the more remarkable considering that the Agency has about 600 autonomous fundholders. These fundholders must be prudent managers and must build into their spending plans the necessary safeguards to avoid violation of the Antideficiency Act under Title 31 of the United States Code; therefore, this does not allow them to spend down to a zero balance. Moreover, the Agency relies on the availability of an unobligated balance in order to provide a contingency amount to meet future costs resulting from change orders to facilities projects and employee relocation expenses which are properly chargeable to prior years. In spite of our success over the years in reducing the unobligated balance, the Agency will continue to work actively in achieving an even greater reduction.

MISCELLANEOUS REIMBURSEMENTS

Mr. WHITTEN. According to page 6-2 of the explanatory notes, ARS expects to receive miscellaneous reimbursements totaling $1.2 million in fiscal year 1986 and 1987. For the record please provide the details of these reimbursements.

[The information follows:]

The $1,200,000 identified is for Miscellaneous Contributed Funds for Fiscal Year 1986 and anticipated for Fiscal Year 1987. These funds are from Non-Federal sources. The Miscellaneous Contributed Funds reflected are estimated receipts for various research activities such as: Increased artichoke production, Crop pest control, Pesticide residues in alfalfa pollen and nectar, Lignite (coal) surface mining, Reclamation of bentonite mine spoils, Sludge testing, Sedimentation analysis, Wind erosion, and Dryland farming research. Current contributors of these Non-Federal funds are: Artichoke Research Association; Cotton, Incorporated; Food and Agriculture Organization; Shell Oil Company; Washington Alfalfa Seed Company; States of

Maryland, Tennessee, Texas and Wyoming; and Universities at Mississippi, Nebraska and Montana.

BARD AGREEMENT

Mr. WHITTEN. According to the notes, ARS will receive $600,000 and 5 staff years in connection with the Binational Research and Development Agreement in fiscal year 1987. Please describe in some detail the activities undertaken through this agreement and the ARS role under this agreement.

Dr. KINNEY. The Binational Agricultural Research and Development Fund (BARD) supports cooperative research projects of mutual interest to the United States and Israel. Currently there are 90 BARD projects in which ARS scientists are actively involved.

[The information follows:]

The categories of research and numbers of ARS active grants are as follows:

ARS BARD RESEARCH GRANTS

Agricultural engineering (5)

Automation and electronics for dairy herd management.
Production system for once-over harvesting of cantaloupe.
Basic studies on heat and mass transfer relationships for fruits and vegetables packed in fiberboard shipping containers.
Quality sorting of date fruits based on firmness.
Measurement of shock impulses inflicted on agricultural products.

Animal production (5)

Selecting broilers for low or high abdominal fat: genetic, nutritional and environmental aspects.
Feed restriction to improve feed efficiency in chickens and turkeys.
Electrical properties of genital tissues relative to their hydration throughout reproductive events of cows.
Development of methods for genetic analysis of discrete traits of economic importance in US and Israeli dairy cattle populations.
Molecular approaches to improvements of economic traits in poultry.

Animal protection (11)

A genetic engineering approach to immunizing chickens against Marek's disease and development of DNA probes for rapid diagnosis of MD tumors.
Evaluation of abraded polyethylene intramammary device (AIMD) in mastitis control.
The role of cell-mediated immunity in genetic resistance to disease in chickens.
Development of an effective subunit vaccine and diagnostic test for bovine Anaplasmosis.
Evaluation of polyethylene intramammary device (IMD) in mastitis control.
Studies of pathogenesis and prevention of milk fever of dairy cows.
Methods of reducing lymphoid leukosis virus infection in foundation egg and broiler breeding flocks and a comparison of economic traits in virus-reduced and unselected flocks.
Immunologic and serologic characteristics of Anaplasma antigens with special reference to improvement of prophylactic immunization.
Immunization of cattle with antigens derived from continuous in vitro cultures of Babesia bovis.
Subunit vaccine for the retrovirus of caprine arthritis-encephalitis and studies of its pathogenesis and epidemiology.
Diagnosis of foot and mouth disease virus by cloning, sequencing and monoclonal antibodies to VP1 of Israeli serotypes.

Horticulture (6)

Somatic hybridization as a tool in citrus breeding.
Indolebutyric acid metabolism in relation to root initiation.

Chemical control of excessive vegetative growth of fruit trees with emphasis on stone fruit species.

Development and adaptation of new techniques to increase efficiency of grape breeding with emphasis on seedlessness and early ripening.

Asexual embryogenesis in the mango (Mangifera indica L.)

Optimization of water and nitrogen application by automated drip irrigation control for apple trees.

General (9)

Immunochemical methods to elucidate hormonal mechanisms in plant senescence and to monitor responses to stress.

Endocrine control of pheromone production in arthropods.

The molecular basis of cytoplasmic male sterility in sugarbeet (Beta vulgaris L.).

Physiology and biochemistry of the herbicide binding protein in relation to photosynthesis: possible relationship to crop protection.

The role of the plasma membrane and tonoplast in salt-tolerance: characterization of the atpases and ion transport properties.

Structure and function of protease inhibitors from legume seeds and cereal grains and their interaction with digestive enzymes of stored product insects.

Pathogenesis and ethylene biosynthesis in Penicillium digitatum: a biotechnological approach.

The rapidly-metabolized herbicide binding protein of the thylakoids: relationship to photosynthesis and crop protection.

Characterization of iron pumps and channels in plant cell membranes using "patch clamp" techniques.

Field crops (7)

Enhancement of cotton development and productivity by means of controlled root growth.

Basic aspects of pollination by honey bees in hybrid cucumber and onion seed production.

Utilization, nature and genetics of mildew resistances in cantaloup.

The evaluation of endemic land-races of wheat as genetic resources for wheat breeding towards environmental and biotic stress tolerance.

Genetic and chemical control of alkaloid biosynthesis in Papaver bracteatum and Papaver somniferum.

Assimilation, sugar transport, and allocation in transplants of vegetable crops limiting factors and hormonal control of post-transplantation recovery.

Genetic regulation of gibberellins in wheat plants.

Plant protection (25)

A study of the potential role of behavioral chemicals for control of Heliothis species and Spodoptera littoralis in cotton.

Morphological, pathological and biochemical comparisons among selected downy mildew pathogens of the Gramineae, Leguminosae and Compositae.

Quantitative genetic analysis of host: parasite relationships in wheat and Septoria glume blotch.

Enhanced biodegradation and reduced pesticide efficacy with repeated application and cropping.

Epidemiological studies on whitefly transmitted viruses in California and Israel.

Tolerance to verticillium wilt of potato: the role of phytotoxin.

Genetic improvement of Talaromyces flavus and its mechanism of action on verticillium.

The role of leafhoppers in transmission of Spiroplasma citri with special reference to stubborn disease of citrus.

Development of synthetic fruit odox visual traps for apple maggot and Mediterranean fruit flies.

Elucidation of type and mechanisms of resistance to the brown leaf rust disease in natural populations of wild barley, Hordeum spontaneum C. Koch. Relevance of this knowledge to genetic control of diseases in major crops.

Genetic and biological control of septoria diseases of wheat.

Development of cantaloup varieties and advanced breeding lines with resistance to the fungus disease complex in both the USA and Israel with special emphasis on resistance to downy mildew.

Effect of environmental and cultural stresses on the relationship between citrus and vesicular-arbuscular mycorrhizal fungi.

Chemical interference with the root-knot nematode (Meloidogyne spp.) host compatibility.

Isolation, identification and synthesis of cossid moths sex pheromones.

The induction of laccase activity in botrytis cinerea and the function of the enzyme during infection of the host.

Development of plant pathogens for weed control.

Varroa mite-honeybee interactions under subtropical conditions.

Chemical attractants for sap beetles attacking fruit crops.

Evaluation and transfer to wheat of leaf rust resistance found in natural populations of triticum dicoccoides, aegilops & agropyron indigenous to Israel.

Mollicutes that cause plant disease: detection, cultivation, and physiology.

The effect of biological, meteorological, and cultural factors on development of septoria leaf blotches on wheat.

Improvement by plasmid transfer of bacillus thuringiensis for control of agricultural and public health pests.

Slow decline of citrus: characterization of tylunchulus semipenetrans biotypes and plant resistance mechanisms.

Monoclonal antibodies and ELISA assays for predation studies on Heliothis armigera in Israel and foreign exploration for predators of Heliothis zea.

Soil and water (13)

Controlled traffic for cropping systems to reduce cost, energy and improve soil and water conservation.

Sediment-water processes as a management tool for water quality control in impoundments.

Combined application of liquid fertilizers and pesticides through irrigation systems.

Time domain reflectometry: simultaneous in-situ measurement of soil water content and salinity.

Improving estimates of evapotranspiration from meteorological data for the control of irrigation for cotton and other field crops.

Control of nonfumigant nematicide distribution and activity in irrigated soils.

Development of methods for designing drainage systems for irrigated lands with nonuniform boundary conditions.

Groundwater pollution as a result of high concentrations of pesticides.

Crop production and water utilization under conditions of shallow, saline ground water using saline irrigation water.

Irrigation scheduling of orchards based on direct measurement of transpiration.

Development of effective methods of CO2 enrichment for field-grown cotton.

Rainfall infiltration as affected by soil aggregation resulting from different tillage methods.

Development of guides on the susceptibility of soils to excessive compaction.

Food technology (9)

Detection and control of campylobacter jejuni in poultry and red meats.

Protection of grain from insect damage through storage in semi-arid and arid regions.

The evaluation of potential fumigants as alternatives to chlorinated and brominated compounds and the effects of the environment on their efficacy.

Mechanisms of action and uses of anaerobiosis and anaerobic intermediates for the post harvest regulation of fruit quality.

Integration of modified atmospheres for disinfestation of dried fruits.

Suppression of insecticide resistance by inhibition of detoxification mechanisms in stored product insects.

Heat treatment to retard decay development and physiological changes in film-wrapped horticultural crops.

Yellowing and bleaching of wool.

Biological control of postharvest fruit diseases.

BUILDINGS AND FACILITIES

Mr. WHITTEN. The Fiscal Year 1987 budget contains no request for buildings and facilities. Please provide for the record a status report on all ARS construction projects.

[The information follows:]

At present, the status of each project is as stated below:

The *South Central Small Farms Research Center* to be located in *Booneville, Arkansas,* is complete from the design standpoint. A construction contract will be awarded in the third quarter of Fiscal Year 1986. Construction completion is projected for the third quarter of Fiscal Year 1987.

The *National Soil Tilth Center* to be located in *Ames, Iowa,* is near design completion. Design will be complete in the third quarter of Fiscal Year 1986. In view of the Department's decision to reprogram funds to cover citrus canker costs, the construction of this project has been deferred.

The *National Small Grains Germplasm Research Facility* to be located in *Aberdeen, Idaho,* is in the program development stage. An Architectural-Engineering (A-E) firm has been selected to plan and design this facility. This firm is Cline, Small, Hamill, Quintieri, Associates of *Boise, Idaho.* An A-E contract for design will be awarded in the third quarter of Fiscal Year 1986. Design completion is projected for the second quarter of Fiscal Year 1987. Construction Contract award is projected for the third quarter of Fiscal Year 1987 with construction completion projected for the fourth quarter of Fiscal Year 1988.

The *Human Nutrition Research Center* at *Tufts University* in *Boston, Massachusetts,* is complete except for some construction deficiencies which are being corrected. The majority of the heating, ventilation, and air-conditioning problems have been corrected in the animal holding and laboratory areas. Exterior building water leaks exist, and a plan for correction is being worked on.

The *Addition to the USDA-ARS Sedimentation Laboratory* to be located in *Oxford, Mississippi,* is under construction. A construction contract was awarded in December 1985. Construction completion is projected for the second quarter of Fiscal Year 1987.

The *Laboratory Additions* at the *Plum Island Animal Disease Center* which were stopped in March 1979 due to contractor default are complete. Consolidation of all laboratory facilities into one building (Building 101) for joint Agricultural Research Service (ARS)/Animal and Plant Health Inspection Service (APHIS) use and finishing the existing vaccine research laboratory building is being evaluated.

The *Sunflower and Sugarbeet Research Laboratory* to be located in *Fargo, North Dakota* is nearing design completion. Design will be complete in the third quarter of Fiscal Year 1986. Construction is projected to be awarded in the fourth quarter of Fiscal Year 1986 and be completed in the fourth quarter of Fiscal Year 1988.

Phase I of the *South Central Agricultural Research Center* in *Lane, Oklahoma,* is complete and being used. The Phase II construction of this project started in January 1986. Construction is projected to be completed in the first quarter of Fiscal Year 1987.

The *National Forage Seed Production Research Center* in *Corvallis, Oregon,* is under construction. Construction started in the first quarter of Fiscal Year 1986. The construction is a little ahead of schedule and is projected to be completed in the first quarter of Fiscal Year 1987.

The *Children's Nutrition Research Center* located in *Houston, Texas,* is complete from a planning and design standpoint. The first phase of construction which is the foundation and parking garage is underway. This construction is 3 to 4 months behind schedule due to weather and scheduling and project management deficiencies on the part of the contractor. A labor strike by some of the construction trades is now also contributing to the delay. Construction completion for the first phase is projected for the third quarter of Fiscal Year 1986. Bids covering the construction of the second and last phase of the project are due on April 8, 1986. A construction contract award for this phase is projected for the third quarter of Fiscal Year 1986 to coincide with completion of Phase I. Construction completion for the entire project is projected for the first quarter of Fiscal Year 1988.

The *Plant Stress and Water Conservation Research Laboratory* to be located in *Lubbock, Texas,* is presently on hold since a lease agreement for the site has not been finalized and construction funding is not available. Design of the Central Laboratory is complete. Design of the headhouse/greenhouse and some necessary redesign to the Central Laboratory (due to site location change) are on hold.

The *Arthropod-Borne Animal Disease Research Center* to be located in *Fort Collins, Colorado,* was estimated to cost in excess of $40 million for construction. It was decided that this was an unlikely option during the next few years, and the construction of a new facility was not essential for ARS to carry out its mission. The research program was relocated into facilities designed for animal disease research at an appropriate level of biological security at the University of Wyoming, a land-grant institution with compatible, complementary research activities.

The *Virginia-Maryland Regional College of Veterinary Medicine* to be located in *Blacksburg, Virginia,* is under construction. Virginia Polytechnic Institute and State

University awarded the construction contract using Federal Grant Funds and Regional State Participant Funds in the first quarter of Fiscal Year 1985. Construction is expected to be completed in the second quarter of Fiscal Year 1987.

The *Old West Regional Veterinary School:* In the conference report on H.R. 3037 making appropriations for Agriculture, Rural Development and Related Agencies programs for Fiscal Year 1986, the conferees requested a report on the use of the funds appropriated for the Nebraska project. Since the matching requirement included in the report on Fiscal Year 1984 has not been met, no obligation of funds has been made for this purpose, and the full $12,050,000 remains unobligated. In addition, planning funds in the amount of $827,000 were made available for that project in the Fiscal Year 1983 appropriation. These funds also remain unobligated.

The conference report further proposed that the funds be used for a clinical veterinary training facility and for research in food processing, transportation, and marketing systems. A plan provided by Congresswoman Smith outlines the use of $11 million of the Fiscal Year 1984 funds to construct three facilities. Of that amount, $7 million would be matched by an equal amount of State funds to construct and equip a veterinary training facility ($1.5 million) at Clay Center and a food processing, transportation, and marketing center ($5.5 million) at Lincoln. The remaining $4 million would be reprogrammed to fund a facility and equipment for advanced studies in food animal medicine at Clay Center. Planning and construction of this Federal facility would be managed by ARS. Implementation of this plan is proceeding.

INDUSTRY CONTRIBUTIONS

Mr. WHITTEN. Please provide for the record a list of the contributions you have received from industry during the past 12 months, indicating the purpose of each contribution.

[The information follows:]

ACID RAIN

Mr. WHITTEN. How much is included in the ARS budget for research on acid rain for fiscal years 1985, 1986, and 1987?

Dr. KINNEY. Included in the ARS budget for research on acid rain for fiscal years 1985 are $384,000; 1986, $365,000; and 1987, $382,000.

Mr. WHITTEN. Please provide a description of your current acid rain research efforts.

Dr. KINNEY. ARS's program on acidic deposition research is headquartered at Raleigh, North Carolina, and funded at a level of $365,000. The purpose of the program is to determine effects of acidic deposition on productivity of crops and soils. It considers not only effects due to acid deposition, but also interactions of acid rain with biological and environmental factors and other air pollutants. Preliminary results indicate that tomato, tobacco, eggplant, and marigold are the most sensitive species, and that they suffer slight to moderate growth decreases after repeated exposures to acid rain. There appears to be little or no affect on seed production in soybeans and wheat when treated with acid rain during flowering. There may, however, be some adverse impact on yield and fiber quality when acid rain occurs on cotton flowers.

JOINT UNITED STATES-CANADIAN ACID RAIN RESEARCH

Mr. WHITTEN. Was ARS involved in the joint U.S.-Canadian acid rain research activity?

Dr. KINNEY. No, ARS was not directly involved in the joint U.S.-Canadian acid rain research activity. The Cooperative State Research Service was the U.S. representative in the effort, and ARS provided data and assistance where needed.

COMPLETED RESEARCH PROJECTS

Mr. WHITTEN. Please provide for the record a list of research projects completed during fiscal year 1985.

[The information follows:]

In fiscal year 1985, ARS initiated and completed the following project and location changes:

1. Knoxville, Tennessee. Relocated cotton physiology research and clothing and textiles research to Southern Regional Research Center at New Orleans, Louisiana.
2. Tifton, Georgia. Terminated biomass energy research and shifted personnel and resources to higher priority programs at the same location including energy conservation, crop production efficiency, and groundwater quality research.
3. Peoria, Illinois. Reoriented current biomass energy research, personnel, and resources at the same location to new fundamental research approaches to the conversion of crops to unique energy sources.
4. Vincennes, Indiana. Terminated fruit and vegetable research of local application to southwestern Indiana melon growers and shifted personnel and resources to national problems on cereal insect resistance, horticultural production in the southeast, and discovery of new biological control organisms.
5. West Lafayette, Indiana. Relocated livestock genetic research to Clay Center, Nebraska.
6. Otis, Massachusetts. Relocated gypsy moth research to Beltsville, Maryland. Past mission of research support to APHIS for rearing gypsy moth and virus control agents was complete.
7. Denver, Colorado. Relocated vector-borne animal disease research program to Laramie, Wyoming, because the ARS activities did not fit the planned use of the facilities by GSA in Denver.

8. Laramie, Wyoming. Relocated bee pesticide research to Weslaco, Texas, to initiate new research on controls for parasitic tracheal mites affecting honey bees.

9. Houston, Texas. Relocated remote sensing research to Beltsville, Maryland.

In addition, ARS scientists initiated in 1985 the termination or revision of approximately 500 projects for the purpose of documenting new and improved research approaches to existing lines of research. Research personnel and funding resources stayed at the same location to initiate new projects. These revisions affected approximately 25 percent of all ARS projects nationwide but did not change substantively the overall program balance, commodity, or problem orientation of the research.

Mr. WHITTEN. Please also prvide for the record a list of research activities you plan to discontinue during fiscal years 1986 and 1987, and the reasons for discontinuing that research.

[The information follows:]

ARS has not yet developed specific plans for discontinuance of any research projects in fiscal year 1987. Such plans will be dependent on future assessments of research progress in 1986 and consideration of new problems and priorities that arise. ARS will continue to keep the committee appraised of plans to close research locations. In fiscal year 1986, ARS currently is implementing the following project and location changes:

1. Madison, Wisconsin. Relocate bee research personnel and resources to Baton Rouge, Louisiana; Weslaco, Texas; and Tucson, Arizona, to accelerate research on Africanized bees, parasitic mites, and pollination.

2. Stillwater, Oklahoma. Relocate bee research scientist on alfalfa pollination to Weslaco, Texas, to accelerate research on bee parasitic mites and presticide toxicity.

3. Rio Piedras, Puerto Rico. Consolidate farm production system research at Mayaguez, Puerto Rico, to continue research on tropical crop productivity and soil fertility.

4. College Station, Texas. Terminate meat processing research and accelerate research on post-harvest crop quality, pesticide application, and bollworm/budworm control.

5. Riverside, California. One scientist on citrus insect management will be relocated to Weslaco, Texas, to increase research effort on export/import problems with citrus and mango attributable to fruit fly species.

6. Albany, California. One scientist on plant pathogen biocontrol of weeds will be relocated to Frederick, Maryland, to conduct similar research in specialized plant quarantine facilities available there.

TEMPORARY EMPLOYMENT

Mr. WHITTEN. The budget request proposes to change the appropriations language relating to field employment from "field employment" to "temporary employment." Please explain in some detail the need to make this change.

Dr. KINNEY. ARS hires temporary field employees who actually work in the fields on research crops, and, we also hire temporary employees who work in units subordinate to ARS Headquarters which are commonly referred to as field organizations.

The appropriation language speaks to "field employment" and 7 U.S.C. 2225 says . . . "The Department of Agriculture may employ persons or organizations on a temporary basis, by contract or otherwise; provided, that no expenditures for such temporary employment shall be made unless provision is made therefor in the applicable appropriation and the cost thereof is not in excess of limitations prescribed therein."

ARS was concerned that auditors would—could view the term "field" as meaning "below headquarters" or as meaning "people actually working in fields." The change to the word "temporary" will give ARS greater latitude in satisfying temporary, intermittent manpower needs at all levels of the organization through pur-

INDUSTRY CONTRIBUTIONS

Contributor	Amount	Purpose of Research
American Cocoa Research Institute	$ 18,787	Disease-free collection of cocoa plant material, Resistance to disease and insects.
American Dairy Goat Foundation	1,200	Development of genetic evaluation.
American Orchid Society	500	New crops.
American Soybean Association	5,318	Oils and lecithin as dust suppressant/additives in corn.
American Sugarcane League	6,924	Control of weeds in sugarcane.
California Kiwifruit Commission	1,000	Quality maintenance in exported kiwifruits.
California Rice Research Board	44	Deterioration in stored rice.
Cotton Foundation	5,384	Determining atmospheric ozone, Study of tobacco budworm.
Electric Power Research Institute	25,310	Operational data for wind turbines.
ICI Americas, Inc.	14,356	Controlling vegetative growth of fruit trees.
National Cotton Council	1,247	Cotton fiber research.
National Council of Paper Industries	17,000	Loblolly pine.
New York Florist Club, Inc.	720	New crops.
North American Blueberry Council	3,572	Cultivars for virus elimination.
Oregon Strawberry Commission	7,020	Improve methods of heat treatment for strawberries.
Society of American Florists	190	New crops.
Solar Energy Research Institute	500	Methane from manure-straw mixtures.

INDUSTRY CONTRIBUTIONS (Continued)

Contributor	Amount	Purpose of Research
State of California	$ 36,738	Saline drainage.
State of Florida	45,500	Hydro nutrient transfer relationships, Citrus abscission.
W. R. Grace and Company	1,640	Feasibility and efficiency study of diseases of bedding.
Washington Red Raspberry Commission	2,952	Development of heat treatment and shoot culture.
World Health Organization	4,202	Development of procedures for bacillus sphaericus, Control of insect vectors.
California Beet Growers Association	1,000	Virus diseases and improved beets in the Imperial Valley.

chase orders and contracts. It will also bring our appropriation language in line with 7 U.S.C. 2225—which refers to "temporary," not "field."

Mr. WHITTEN. what effect would this change have on agency employment, and will it have any effect on existing employees?

Dr. KINNEY. This change will not affect agency employment in any manner, nor will it have any effect on existing employees.

OTHER SERVICES

Mr. WHITTEN. Please submit for the record a list of sub-object class expenditures for other services.

[The information follows:]

The sub-object class expenditures for other services for fiscal year 1985 are as follows:

Contractual services performed by other Federal agencies	$3,926,000
National Finance Center services	3,346,000
Repair, alteration or maintenance of equipment	21,590,000
Repair, alteration or maintenance of space (interior)	6,734,000
Repair, alteration or maintenance of structure (exterior)	2,179,000
Repair of office equipment	1,242,000
Other contractual services	7,294,000
Engineering contracts	1,460,000
Research	27,257,000
Other agreements	3,034,000
ADP data processing services	1,123,000
Specific cooperative agreements	8,871,000
General cooperative agreements	10,003,000
All other	3,105,000
Total, other services	101,164,000

NEW MARKETS FOR DAIRY PRODUCTS

MR. WHITTEN. In the explanatory notes on page 6–14 reference is made to the fact that lactose is an impediment in developing new export markets for dairy products. Why is lactose an impediment?

Dr. KINNEY. Developing nations of Asia, Africa, and Central and South America are closed markets for milk beverages because of perceived or actual lactose intolerance. Lactose, when consumed by intolerant populations produces physical discomfort and possibly diarrhea. Lactose is also an impediment to the export of shelf-stable concentrated milk products since it is a contributing factor in the formation of the undesirable gelling phenomena.

MR. WHITTEN. How can the impediment be removed?

Dr. KINNEY. Biotechnology offers a major opportunity. With use of genetically engineered microorganisms, "engineered" immobilized enzymes, and new membrane and concentration technologies, it should be possible to meet the market requirements with new forms of milk products free of lactose.

MR. WHITTEN. By so doing, what new markets do you think the U.S. can penetrate with what products?

Dr. KINNEY. Elimination of lactose in milk products could open markets in Japan, China, India, Thailand, Korea, and most countries in Africa and Central America. Whole and nonfat milks in a concentrated form, when ultrapasturized and aseptically packaged, would be shelf-stable, convenient, require no refrigeration, and have a reduced cost of shipping. Milk in this form would be both a

product and an ingredient for use in many other acceptable forms such as ice cream and fermented products.

NEW PRODUCTS FROM CORN, WHEAT, COTTON, AND SOYBEANS

MR. WHITTEN. According to the explanatory notes on page 6–14 you are proposing an increase in the research to develop new products from corn, wheat, cotton, and soybeans or their starches, oils, and proteins in order to develop new markets for these commodities. Please describe in general terms the types of new products that could be developed and what their market potential is.

Dr. KINNEY. Well over 35 billion pounds of feedstock chemicals are produced annually from petroleum. Oxychemicals—e.g. alkene oxides for plastics—at the 25 billion pound level if produced at a 75 percent conversion rate from starch would by themselves utilize 13 to 15 percent of the corn crop. Substitution of starch for petroleum in plastics production offers a 50 billion pound annual market opportunity. Starch-containing plastics can have a market advantage since they can be made biodegradable. Projected market for plastic films in agricultural use alone for 1990 is 43 million pounds. Biodegradable films could expand this market rapidly by replacing nondegradable mulch films and introducing new products. Genetic engineering of the soybean to produce lauric acid is a long-term but technically viable approach. Lauric acid is a major ingredient used by the detergent, soap, pharmaceutical and cosmetic industries. Imports of lauric acid sources—coconut and palm kernel oils—exceeded 200 million dollars in 1983. U.S. soap and detergent manufacturers face uncertainties of supply and are seeking alternative sources. Domestic and foreign demand for seafood products is rising exponentially. Aquaculture, fresh, brackish and salt, is expanding to meet it. Much of the feed formulation currently used is based on tradition, not fact. Limited studies suggest that oilseed and grain proteins could be used in much greater quantities. Nonwoven fiber products—such as industrial wipes—exceed more than a billion pounds annually. Elimination of technical barriers should permit cotton to assume a significant portion of this market.

REMOVE BARRIERS TO COMMODITY EXPORTS

Mr. WHITTEN. You also discuss on page 6–15 new developments in the treatment and preservation of grain, development of on-farm pest controls, and alternative means to increase the shelf-life of fresh meat as activities in support of APHIS, FSIS, and FGIS. Are these activities also receiving the priority attention of the agencies, and what is their contribution to these efforts?

Dr. KINNEY. Identification of each of these activities is the result of close collaboration and consultation with the respective agency in which the priority and approach taken are reached through consensus. Their contribution to these efforts varies with the subject and ranges from cooperative participation in the research to independent evaluation of the research results.

LIGHTLY PROCESSED FRUITS AND VEGETABLES

Mr. WHITTEN. You are also proposing to increase the budget for this type of research by a factor of 5. Is this a reaction to existing consumer preference or an effort to develop new markets?

Dr. KINNEY. This increase was developed in response to what the major forecasters agree are significant trends in the food habits and consumer demands by the Year 2000. Interest in nutrition, healthful eating, and fitness will become a permanent part of the American life-style. New technologies and new ingredients that will help food products achieve a fresher flavor, truer color, and more "natural" state will be widely used and accepted. New technologies to process fruits and vegetables will respond to these important trends and offer expanded markets here and abroad. Increased demand for horticultural crops will offer many farmers opportunities to divert portions of their farmlands from field crops now in surplus production.

Mr. WHITTEN. You state that funds will be directed to those fruits and vegetables with the greatest market potential. Please provide for the record a list of the fruits and vegetables having the greatest market potential with this method of processing and an estimate of the market potential.

[The information follows:]

Commodities/form	Markets
Citrus—segments, juice sacks	Salads, deserts, carbonated beverages
Berries—partial dehydration, extended shelf-life	Packaged deserts, cake mixes, salads, ice creams, snacks
Peaches—segments, partial dehydration	New types of deserts, salads, fruit cocktail, blended fruit drinks, snacks
Cherries—extended shelf-life, new forms	Salads, deserts, fruit cocktail, snacks
Pears/Apples—segments, partial dehydration, extended shelf-life fresh	Salads, deserts, snacks, fruit beverages
Celery/Carrots—segments, partial dehydration, extended shelf-life, fresh	Ready-to-eat snacks
Tomatoes—segments, extended shelf-life, fresh	Salads, ready-to-eat snacks
Sweet Corn—extended shelf-life, fresh	Vegetable side dish
Broccoli/Cauliflower—extended shelf-life, fresh	Ready-to-eat snacks

Currently a market for these products does not exist and the market potential cannot be estimated. It can be stated that increasing consumer demand for freshness, natural, convenience, variety, and the continued trend to spend more of the food dollar away from home—greater than 50 percent by 1990—all suggest a rapidly expanding market of significant potential if the criteria can be met.

Mr. WHITTEN. At what location will this research be conducted?

Dr. KINNEY. Albany, California; Lane, Oklahoma; Beltsville, Maryland; Winter Haven, Florida; and several other locations yet to be determined.

CONTINGENCY RESEARCH FUND

Mr. WHITTEN. According to the explanatory notes on pages 6–17, ARS spent $79,000 from the contingency fund for the disposal of hazardous waste chemicals in South Dakota, Georgia, Florida, and Louisiana. What chemicals were disposed of and in what manner?

Dr. KINNEY. The items disposed of in Georgia, Florida, and South Dakota were small quantities of several thousand waste, excess, and expired chemicals no longer suitable for use. These chemicals covered a broad range of chemical classes including pesticides, organic solvents, metals, corrosives, oxidizers, and poisons. Including the packing materials required for compatible packing, safe transport, and proper disposal, approximately 31,000 pounds were turned over to licensed hazardous waste contractors for disposal by secure landfilling or incineration at permitted facilities in accordance with Federal and State Environmental Protection Agency regulations. In Louisiana, approximately 900 cubic yards of lead-containing soil were excavated and disposed in accordance with regulatory requirements at an approved landfill.

Mr. WHITTEN. Did disposal of these chemicals result from normal operating procedures?

Dr. KINNEY. Disposal of waste research chemicals is a normal operating expense, however, recent changes in the regulations governing hazardous waste generation made it desirable to modify and streamline procedures in our location. These changes resulted in an unusually large onetime requirement for disposal. Cleanup of the Louisiana site was made necessary by changes in acceptable industry practice.

NEW COTTON GINNING PROCESS

Mr. WHITTEN. On page 6g–11 of the explanatory notes reference is made to a new cotton ginning process that not only reduces the energy cost and other processing costs, but also improves the quality of processed cotton. Pleases provide an estimate of how much ginning costs could be reduced per unit.

Dr. KINNEY. Capital and energy costs will be reduced about one-third to one-half. Once the technology is implemented by industry, we estimate conservatively there should be at least a 2 cents per pound reduction in the total ginning cost.

Mr. WHITTEN. Is the new process commercially available? If not, when could it be made available?

Dr. KINNEY. It is not yet available. Cotton, Incorporated is trying to arrange for a full sized prototype installation to be running in a commercial gin in the next—1986–1987—harvesting season. Should the cost and quality results be as expected, we would hope for other commercial untis in the following season.

SOYBEAN OIL

Mr. WHITTEN. On page 6g–5 of the explanataory notes you cite as an accomplishment an understanding of how plants synthesize oil may lead to an increased soybean oil production. Will not an increase in production of soybeans or soybean oil crowd out demand for other oils, such as corn, safflower, and peanut?

Dr. KINNEY. Corn, safflower, and peanut oils have each found their market position based on some unique characteristic such as flavor or polyunsaturation and enter the market in limited quantities. Soybean oil as the most widely used oil in the United States competes mainly with imports such as palm and rapeseed oil. Increased oil content in U.S. soybeans is important if whole U.S. beans are to compete effectively in world markets with soybeans from Brazil and Argentina.

GENE TRANSFER AND GERMPLASM ENHANCEMENT

Mr. WHITTEN. The fiscal year 1987 budget requests an increase of $1.9 million for gene transfer and germplasm enhancement. The reason being to develop technologies required for the transfer of genes into economically important crop plants. For the record please provide an explanation of what you consider an economically important crop plant, and what plants presently meet that criteria.

The information follows:]

The ARS considers any crop that brings a profitable cash receipt to the grower as an economically important crop. The crops can be generally listed in their categories of field, horticultural and commercial vegetable crops. The crops are listed alphabetically under those listings; Field crops—barley, beans, corn, cotton, flaxseed, hay, hops, oats, peanuts, potatoes, rice, rye, sorghum, soybeans, sugar beets, sugarcane, sunflowers, sweet potatotes, taro, tobacco, and wheat; Horticultural crops—almonds, apples, apricots, avocadoes, blueberries, cherries, coffee, cranberries, dates, figs, filberts, grapes, grapefruit, lemons, limes, macadamia nuts, nectarines, olives, oranges, pecans, papayas, pineapples, plums, pomegranates, prunes, strawberries, tangelos, tangerines, temples, and walnuts; Commercial vegetable crops—asparagus, broccoli, carrots, cauliflower, celery, cucumbers, green peas, honeydew, lettuce, onions, snap beans, sweet corn and tomatoes.

Florist and nursery plants, certain forest products and specialty crops, and industrial plants such as cuphea, crambe, kenaf, and guayule that offer potential for oils, paper fiber, and rubber are also considered crops having important economic value.

TOBACCO RESEARCH

Mr. WHITTEN. Would you please provide a description of your current research work on tobacco?

Dr. KINNEY. We are currently conducting research on tobacco at eight locations. The objectives of the research are to find ways to produce safer tobacco products, reduce production costs, control insects in stored tobacco, and enhance quality to improve the competitiveness of U.S. tobacco in world markets. In addition, we are using tobacco as a model plant to develop new technologies in genetic engineering that have broad application to other crop plants.

Mr. WHITTEN. Would you please list the resources devoted to tobacco research at each location for fiscal years 1985, 1986, and 1987?

[The information follows:]

Location	Funding		
	FY 1985 Estimate	FY 1986 Estimate	Fy 1987 Planned
Tobacco Research:			
Beltsville, MD	$826,800	$786,500	$821,800
Tifton, GA	41,900	39,800	41,600
Athens, GA	1,076,300	1,023,800	1,069,800

Location	Funding		
	FY 1985 Estimated	FY 1986 Estimate	Fy 1987 Planned
Raleigh, NC	102,100		
Oxford, NC	[1] 2,133,700	[1] 2,127,100	[1] 2,222,700
Greeneville, TN	57,400	54,600	57,100
Lexington, KY	796,800	757,900	792,000
Total	5,035,000	4,789,700	5,005,000
Control of Insects in Stored Tobacco:			
Richmond, VA	193,000		
Oxford, NC		183,600	191,800
Gainesville, FL	29,900	28,400	29,700
Total	222,000	212,000	221,500
Grand total	5,257,900	5,001,700	5,226,500

[1] Includes $600,000 for cooperative agreement research with Kentucky in FY-85, $570,800 in FY-86, and $596,400 in FY-87.

BRUCELLOSIS RESEARCH

Mr. WHITTEN. Would you please describe for the Committee the work you are doing in connection with brucellosis research?

Dr. KINNEY. Improved diagnostic procedures which will allow diagnostic laboratories to distinguish vaccine serological titers from field infected titers in individual animals and development of improved vaccines continue to be the two major thrusts of the ARS program. Primary efforts are found in the following five project areas—improved methods for diagnosis of bovine brucellosis, immune mechanisms of bovine brucellosis, improved immunogens for prevention of bovine brucellosis, cytopathology of bovine brucellosis, and pathogenicity of bovine brucellosis. ARS continues to work through its extramural research program and in cooperation with several universities to find answers to technological problems as posed by the Animal and Plant Health Inspection Service-Veterinary Services and the cattle industry. Projects are currently underway on a subunit antigen that we hope will be an effective immunogen which the biologics industry may further develop into an effective vaccine. The duration of immunity trials on low-dose vaccine are still in progress in Oklahoma and at the National Animal Disease Center in Ames, Iowa.

Mr. WHITTEN. Would you please describe the work that is being done at each location?

Dr. KINNEY. Work is being done at the National Animal Disease Center on improved methods for diagnosing bovine brucellosis, immune mechanisms of bovine brucellosis, improved immunogens for prevention of bovine brucellosis, cytopathology of bovine brucellosis, pathogenicity of bovine brucellosis, and integrated reproduction management-bovine brucellosis. Extramural work includes cellular interactions and immune response mechanisms in brucellosis infected and immunized cattle at the University of Wisconsin, ontogeny of cellular defense mechanisms against Brucella abortus in cattle at Louisiana State University, improved methods for diagnosis and control of brucellosis at Texas A&M University, brucellosis research including molecular biology, applied vaccine studies, and technology transfer at Oklahoma State University, production of

brucella surface proteins with recombinant DNA technology at Iowa State University, and development of nonviable vaccine for bovine brucellosis at Cornell University.

Mr. WHITTEN. Would you please provide the funding, by location, for brucellosis for fiscal years 1985, 1986, and 1987?

[The information follows:]

Location	FY 1985	FY 1986	FY 1987
University of Florida	42,000	0	0
University of Hawaii	42,000	0	0
Iowa State University	29,090	30,000	30,000
Louisiana State Univeristy	0	25,000	25,000
Cornell University	30,000	30,000	30,000
Oklahoma State University	132,800	132,800	132,800
Oklahoma State University and Kerr Foundation	150,000	158,500	159,000
Kerr Foundation (Tech. transfer)	140,000	60,000	100,000
University of Wisconsin	0	65,000	65,000
National Animal Disease Center	2,664,500	2,398,200	2,644,700

BLUETONGUE RESEARCH

Mr. WHITTEN. Would you please describe for the record your bluetongue research program, indicating where it is carried out, the amout of resources devoted to it, and your plans for fiscal years 1985, 1986, and 1987?

Dr. KINNEY. The Arthropod-borne Animal Disease Research Laboratory (ABADRL) has now been relocated from Denver, Colorado, to Laramie, Wyoming. Its mission continues to be to conduct research on arthropod-transmitted diseases of domestic farm amimals. The primary emphasis is to develop improved diagnostic tests for bluetongue and technology for improving vaccine development for bluetongue. The total research program involves both domestic and exotic strains of bluetongue, Eastern equine encephalomyelitis, Western equine encephalomyelitis, Venezuelan equine encephalomelitis, epizootin hemorrhagic disease, vesicular stomatitis, and other arboviruses in ruminants and horses, and studies involving the arthropod vetors of these diseases. We are moving ahead on added research in bluetongue virus transmission in cattle and sheep embroyos. We plan to continue a complete program in arthropod-borne virus disease research, with primary emphasis on diagnosis, prevention, and detection of carrier animals of foreign and domestic strains of bluetongue virus. The ARS budget for arbovirus research at the ABADRL for fiscal years 1985, 1986, and 1987 is $2,196,100, $2,086,400, and $2,180,100, respectively.

IMPORTED FIRE ANTS

Mr. WHITTEN. How much is included in your budgets for research on imported fire ants? Would you please indicate the amounts for 1985, 1986, and 1987?

Dr. KINNEY. For fiscal years 1985, 1986, and 1987, research on imported fire ants has been or will be supported by estimated budgets of $1,075,000, $1,013,000, and $1,058,000 respectively.

Mr. WHITTEN. Where is the work carried out, and would you indicate by location?

Dr. KINNEY. All imported fire ant research is conducted by the Insects Affecting Man and Animals Research Laboratory, Gainesville, Florida. Although all budgeted funds are allocated to Gainesville, Florida, field plot studies are carried out in North Carolina, Georgia, Florida, Alabama, Mississippi, and Texas. In addition, through cooperative agreement with the Brazilian counterpart agency of ARS, research on biocontrol is being conducted in Caceres, Mato Grosso, Brazil.

Mr. WHITTEN. How does your budget for research on fire ants relate to the proposal by APHIS to terminate fire ant eradication and control activities?

Dr. KINNEY. The ARS budget for research on imported fire ants will remain stable in order to provide farmers, homeowners, or governmental agencies with improved technologies or strategies for control.

IR–4 RESEARCH

Mr. WHITTEN. How much is included in your budget for fiscal years 1985, 1986, 1987 for IR–4 work?

Dr. KINNEY. For fiscal years 1985, 1986, and 1987 the ARS IR–4 Minor Use Pesticide Program has been or will be supported by estimated budgets of $1,170,000, $1,113,000 and $1,163,000 respectively.

Mr. WHITTEN. What are the various priorities assigned to IR–4 in fiscal years 1986 and 1987?

Dr. KINNEY. The priority areas in FY 1986 and 1987 are on vegetable crops such as peppers, tomatoes, melons, onions, and leafy vegetables, where fungicide, nematicide, herbicide, and insecticide uses are needed to maintain yield and quality. Another priority area in developing data to register pesticides on woody ornamentals such as deciduous and evergreen trees and shrubs. These priorities were identified through IR–4 workshops and meetings where minor use pesticide needs of the agricultural community were evaluated.

HUMAN NUTRITION RESEARCH

Mr. WHITTEN. Would you please provide for the record the budget for each of the human nutrition research facilities for 1985, 1986, and 1987.

[The information follows:]

[In thousands]

	FY 1985	FY 1986	FY 1987
Beltsville Human Nutrition Research Center, Beltsville, MD	$8,005	$7,913	$8,269
Grand Forks Human Nutrition Research Center, Grand Forks, ND	6,190	6,361	6,646
Human Nutrition Research Center on Aging, Boston MA	11,354	11,751	12,279
Children's Nutrition Research Center, Houston, TX	3,589	4,429	4,628
Western Human Nutrition Research Center, San Francisco, CA	3,794	3,662	3,826
Total Human Nutrition Centers	32,932	34,116	35,648

Mr. WHITTEN. Would you please provide for the record the number of ARS staff years for each of those facilities for 1984,

1985, 1986, and 1987, and also indicate the number of non-ARS staff years.

[The information follows:]

	FY 1984	FY 1985	FY 1986	FY 1987
Beltsville:				
ARS Scientist Years	41	42	45	45
ARS Support Staff Years	68	65	74	74
Non-ARS Scientist Years	0	0	6	6
Non-ARS Support Staff Years	13	9	16	16
Grand Forks:				
ARS Scientist Years	8	6	8	13
ARS Support Staff Years	18	17	27	26
Non-ARS Scientist Years	6	5	3	2
Non-ARS Support Staff Years	107	114	103	103
Boston:				
ARS Scientist Years	1	1	1	1
ARS Support Staff Years	2	3	3	3
Non-ARS Scientist Years	37	42	42	42
Non-ARS Support Staff Years	205	207	217	217
Houston:				
ARS Scientist Years	1	1	0	0
ARS Support Staff Years	0	0	0	0
Non-ARS Scientist Years	21	21	20	22
Non-ARS Support Staff Years	27	30	58	62
San Francisco:				
ARS Scientist Years	13	16	17	17
ARS Support Staff Years	19	27	26	31
Non-ARS Scientist Years	0	0	1	2
Non-ARS Support Staff Years	35	33	22	25
Total:				
ARS Scientist Years	64	66	71	76
ARS Support Staff Years	107	112	130	134
Non-ARS Scientist Years	64	68	72	74
Non-ARS Support Staff Years	387	393	416	423

AFRICANIZED BEES

Mr. WHITTEN. Would you please describe in detail what work you are doing in connection with the Africanized bee, as well as the amount of funds devoted to this research?

Dr. KINNEY. ARS research is focused on the development of management technology for protection of the public and the beekeeping industry from adverse effects of the Africanized bees. Research in ARS is currently ongoing to develop detection technology through pheromone responses and also by evaluation of vacant hive forms for attractiveness to Africanized bee swarms. Agricultural Research Service has developed identification technology based on a system of morphometrics. Detailed laboratory identification procedures have been computerized, and these procedures were successfully used in California for identification of Africanized bees. Research is continuing in the critical areas of identification to develop a simpler technique that is less expensive and more rapid. The behavior of movement is being investigated with the development of specialized net traps containing pheromone baits. Research on the identify of drone-congregating areas where mating occurs and the factors that are responsible for geographical locations of these

areas are being investigated. The Agricultural Research Service is examining honey production and pollination in areas where Africanized bees are present and also in areas in which Africanized bees are predicted to spread. Research is also directed toward providing an understanding of the desirable and undesirable characteristics and behavior of Africanized bees. Another major ARS research thrust is to develop barrier technology to include biological, chemical, and physical approaches. In 1986, the research is funded at a level of $615,000.

ACARINE MITE

Mr. WHITTEN. Would you please describe what research you are doing in connection with this particular pest?

Dr. KINNEY. ARS has initiated a research program at Weslaco, Texas, directed to parasitic mite research with emphasis on biology, detection, and pesticide control methods. Research is underway to define the economic impact of mites on honey production and pollination and to develop chemical and non-chemical control of this mite in infested honey bees.

JAPANESE BEETLE

Mr. WHITEN. Are you carrying out any research on the Japanese beetle at the present time? If so, please state the location at which the research is being conducted and the amount of funding.

Dr. KINNEY. Yes, ARS is continuing to develop methods needed by the nursery and ornamental plant industry to satisfy quarantine requirements to ship plants to noninfested areas. Research efforts are concentrated into developing procedures to eliminate Japanese beetle larvae from nursery commodities, particularly the development of area treatments for nursery commodities grown in the field—those that are transferred with field soil into containers or that are balled-and-burlapped for sale—and development of dipping procedures for containerized and balled-and-burlapped nursery stock. This ARS research is located at Wooster, Ohio and the level of funding is $116,300.

POTATO RESEARCH

Mr. WHITTEN. Please describe for the Committee the work you have underway in the field of potato research showing where the work is carried out and the number of people and dollars assigned to each of the locations.

[The information follows:]

We have research on potatoes at 13 locations with emphasis in the following areas: Genetics and cytogenetics; evaluation of exotic potato germplasm for the important horticultural characteristics; breeding for disease and insect resistance, increased yields, nutritional quality, and consumer acceptance; germplasm preservation and maintenance; protoplast fusion and other genetic engineering techniques for transfer of genetic material; genetic variation in plants from tissue culture; physiology of plant growth and use of bioregulating compounds; effect of plant stress on growth, yield, and nutritional quality of potatoes; prediction of potato quality in bulk storage facilities; physical properties associated with quality of processed potatoes; food processing; nature of host plant resistance to major diseases and other pests; biology and control of golden and root-knot nematodes; biological control and integrated pest management of potato insects, diseases, and nematodes; and identifi-

cation and control of disease and insect pests. The estimated level of funding and scientist years (SY) for fiscal year 1986 by location is shown in the following table:

Location	1986 estimate	SY
Albany, CA	$89,900	0.7
Davis, CA	7,600	0.1
Tifton, GA	72,300	0.7
Aberdeen, ID	297,100	2.0
Beltsville, MD	931,100	7.1
Orono, ME	236,600	2.0
East Grand Forks, MN	392,800	4.0
Ithaca, NY	259,200	1.3
Wooster, OH	69,800	0.4
Wyndmoor, PA	965,300	4.2
Yakima, WA	376,000	1.8
Prosser, WA	725,100	2.0
Madison, WI	675,300	3.2
Total	5,098,100	29.5

RESEARCH FACILITIES

Mr. WHITTEN. Would you please provide for the record a listing of the principal types of research and man-years by location for each of your agricultural research facilities.

Dr. KINNEY. The Agricultural Research Service projects are categorized into 6 principal types of research. These 6 categories are: Research on soil and water conservation; Research on plant productivity; Research on animal productivity; Research on commodity conversion and delivery; Human nutrition research; and Integration of agricultural systems. A table of these principal types of research and staff-years, by location, for all agricultural research facilities will be provided.

[The information follows:]

ARS OBLIGATIONS AND STAFF YEARS BY LOCATION AND PROGRAMS

Location Programs	Estimated 1986 Dollars	Staff-Years
Alabama		
Auburn - Research on soil and water conservation, research on plant productivity, and research on animal productivity	$2,397,800	46
Alaska		
Fairbanks - Research on soil and water conservation and research on plant productivity	705,200	4
Arizona		
Phoenix - Research on soil and water conservation, research on plant productivity, and integration of agricultural systems	4,795,400	106
Tucson - Research on soil and water conservation, research on plant productivity, and integration of agricultural systems	3,183,100	75
Total, Arizona	7,978,500	181
Arkansas		
Booneville - Research on plant productivity	931,700	16
Stuttgart - Research on plant productivity	217,100	4
Total, Arkansas	1,148,800	20
California		
Albany - Research on soil and water conservation, research on plant productivity, research on animal productivity, research on commodity conversion and delivery, and human nutrition research	15,826,000	318
Brawley - Research on soil and water conservation, and research on plant productivity	349,700	9
Davis - Research on plant productivity	1,021,500	20
Fresno - Research on soil and water conservation, research on plant productivity, and research on commodity conversion and delivery	3,159,200	58
Pasadena - Research on plant producitvity, research on commodity conversion and delivery	1,854,800	28
Riverside - Research on soil and water conservation, and research on plant productivity	3,278,800	62
Salinas - Research on plant productivity	1,430,000	33
San Francisco - Research on human nutrition	3,248,900	19
Shafter - Research on soil and water conservation, and research on plant productivity	1,172,200	24
Total, California	31,341,100	571
Colorado		
Akron - Research on soil and water conservation	707,700	16
Fort Collins - Research on soil and water conservation, research on plant productivity, and integration of agricultural systems	6,524,400	133
Total, Colorado	7,232,100	149

Location Programs	Estimated 1986 Dollars	Staff-Years
Delaware		
Georgetown - Research on animal productivity.....	540,500	11
Newark - Research on plant productivity.....	561,400	13
Total, Delaware.....	1,101,900	24
District of Columbia		
Program - Research on plant productivity.....	3,429,100	73
Headquarters		
Agency Management Services.....	26,158,100	460
Centrally Financed Programs.....	8,656,400	--
Subtotal, Headquarters.....	34,814,500	460
Total, District of Columbia.....	38,243,600	533
Florida		
Belle Glade - Integration of agricultural systems...	177,400	3
Brooksville - Research on animal productivity.....	418,900	4
Canal Point - Research on plant productivity.....	800,600	21
Fort Lauderdale - Research on plant productivity....	631,300	8
Gainesville - Research on soil and water conservation, research on plant productivity, research on animal productivity, research on commodity conversion and delivery.....	8,287,500	149
Lake Alfred - Research on plant productivity.....	122,500	3
Miami - Research on plant productivity, and research on commodity conversion and delivery.....	1,276,500	27
Orlando - Research on plant productivity, and research on commodity conversion and delivery.....	3,649,000	60
Winter Haven - Research on plant productivity, and research on commodity conversion and delivery.....	884,900	19
Total, Florida.....	16,248,600	294
Georgia		
Athens - Research on soil and water conservation, research on plant productivity, research on animal productivity and research on commodity conversion and delivery.....	10,294,200	193
Byron - Research on soil and water conservation, and research on plant productivity.....	1,625,100	39
Dawson - Research on commoduty conversion and delivery.....	1,084,300	25
Experiment - Research on plant productivity.....	681,400	4
Savannah - Research on commodity conversion and delivery.....	2,405,200	57
Tifton - Research on soil and water conservation, research on plant productivity, and research on commodity conversion and delivery.....	5,404,800	105
Watkinsville - Research on soil and water conservation, and research on plant productivity.....	1,716,800	28
Total, Georgia.....	23,211,800	451

Location Programs	Estimated 1986 Dollars	Staff-Years
Hawaii		
Honolulu - Research on plant productivity, and research on commodity conversion and delivery...	2,876,500	42
Idaho		
Aberdeen - Research on plant productivity.....	765,100	6
Boise - Research on soil and water conservation, and integration of agricultural systems.....	1,011,600	19
Dubois - Research on plant productivity, and research on animal productivity.....	1,216,300	14
Kimberly (Twin Falls) - Research on soil and water conservation.....	2,036,200	44
Total, Idaho.....	5,029,200	83
Illinois		
Peoria - Research on soil and water conservation, research on plant productivity, research on commodity conversion and delivery, and human nutrition research.....	17,109,300	320
Urbana - Research on soil and water conservation, research on plant productivity, and research on animal productivity.....	2,821,300	46
Total, Illinois.....	19,930,600	366
Indiana		
West Lafayette - Research on soil and water conservation, research on plant productivity, research on animal productivity and integration of agricultural systems.....	2,983,100	51
Iowa		
Ames - Research on soil and water conservation, research on plant productivity, and research on animal productivity.....	16,162,700	325
Ankeny - Research on soil and water conservation, and research on plant productivity.....	534,200	10
Total, Iowa.....	16,696,900	335
Kansas		
Manhattan - Research on soil and water conservation, research on plant productivity, and research on commodity conversion and delivery...	3,318,600	68
Kentucky		
Lexington - Research on plant productivity, and research on commodity conversion and delivery...	872,100	21
Louisiana		
Baton Rouge - Research on soil and water conservation, and research on plant productivity.....	1,380,700	30
Houma - Research on plant productivity.....	1,276,400	33
New Orleans - Research on plant productivity, and research on commodity conversion and delivery...	15,234,000	294
Total, Louisiana.....	17,891,100	357

Location Programs	Estimated 1986 Dollars	Staff-Years
Maine		
Orono - Research on soil and water conservation, and research on plant productivity	430,600	7
Maryland		
Beltsville - Research on soil and water conservation, research on plant productivity, research on animal productivity, research on commodity conversion and delivery, human nutrition research, and integration of agricultural systems	66,816,000	1,440
Frederick - Research on plant productivity	1,888,200	34
Hyattsville - Human nutrition research	384,600	11
Total, Maryland	69,088,800	1,485
Massachusetts		
Boston - Human nutrition research	11,163,300	4
Michigan		
East Lansing - Research on plant productivity, research on animal productivity, research on commodity conversion and delivery, and integration of agricultural systems	3,009,100	65
Minnesota		
East Grand Forks - Research on commodity conversion and delivery	366,500	9
Minneapolis - Area Management Costs	1,090,800	6
Morris - Research on soil and water conservation	1,579,400	32
St. Paul - Research on soil and water conservation, research on plant productivity, and research on animal productivity	2,572,400	52
Total, Minnesota	5,609,100	99
Mississippi		
Mississippi State - Research on soil and water conservation, research on plant productivity, research on animal productivity, and integration of agricultural systems	5,483,000	117
Oxford - Research on soil and water conservation	3,028,900	66
Poplarville - Research on plant productivity	362,500	9
Stoneville - Research on soil and water conservation, research on plant productivity, and research on commodity conversion and delivery	8,409,400	170
Total, Mississippi	17,283,800	362
Missouri		
Columbia - Research on soil and water conservation, research on plant productivity, research on animal productivity, and research on commodity conversion and delivery	3,790,200	85

Location Programs	Estimated 1986 Dollars	Staff-Years
Montana		
Bozeman - Research on plant productivity	935,200	20
Miles City - Research on plant productivity, and research on animal productivity	1,516,200	12
Sidney - Research on soil and water conservation	418,500	7
Total, Montana	2,869,900	39
Nebraska		
Clay Center - Research on plant productivity, research on animal productivity, and research on commodity conversion and delivery	7,396,300	53
Lincoln - Research on soil and water conservation, research on plant productivity, and research on animal productivity	2,596,200	41
Total, Nebraska	9,992,500	94
Nevada		
Reno - Research on plant productivity	593,300	12
New Jersey		
New Brunswick - Research on commodity conversion and delivery	466,500	10
New Mexico		
Las Cruces - Research on plant productivity, research on animal productivity, research on commodity conversion and delivery, and integration of agricultural systems	1,192,700	31
New York		
Geneva - Research on plant productivity	556,400	6
Ithaca - Research on soil and water conservation, research on plant productivity, research on animal productivity, and human nutrition research	2,820,100	30
Plum Island - Research on animal productivity	8,422,400	247
Total, New York	11,798,900	283
North Carolina		
Oxford - Research on plant productivity, research on commodity conversion and delivery, and integration of agricultural systems	2,090,800	31
Raleigh - Research on soil and water conservation, research on plant productivity, and research on commodity conversion and delivery	3,717,300	64
Total, North Carolina	5,808,100	95

Location Programs	Estimated 1986 Dollars	Staff-Years
North Dakota		
Fargo - Research on plant productivity, and research on animal productivity	6,482,000	120
Grand Forks - Human nutrition research	5,643,700	26
Mandan - Research on plant productivity	2,234,300	52
Total, North Dakota	14,360,000	198
Ohio		
Columbus - Research on soil and water conservation	187,600	3
Cochocton - Research on soil and water conservation	790,800	20
Delaware - Research on plant productivity	544,500	7
Wooster - Research on plant productivity, and research on animal productivity	1,451,900	33
Total, Ohio	2,974,800	63
Oklahoma		
Durant - Research on soil and water conservation, and integration of agricultural systems	1,815,100	41
El Reno - Research on soil and water conservation, research on plant productivity, and research on animal productivity	1,392,100	30
Lane - Research on plant productivity	449,000	2
Poteau - Research on animal productivity	538,700	7
Stillwater - Research on soil and water conservation, and research on plant productivity	1,722,800	32
Woodward - Research on plant productivity, and integration of agricultural systems	691,300	15
Total, Oklahoma	6,609,000	127
Oregon		
Burns - Integration of agricultural systems	203,700	2
Corvallis - Research on plant productivity, and research on commodity conversion and delivery	2,445,200	42
Pendleton - Research on soil and water conservation, and integration of agricultural systems	918,100	22
Portland - Area Management Costs	918,300	17
Total, Oregon	4,485,300	83
Pennsylvania		
University Park - Research on soil and water conservation, research on plant productivity, and research on animal productivity	2,572,100	53
Wyndmoor - Research on soil and water conservation, research on plant productivity, research on animal productivity, research on commodity conversion and delivery, and human nutrition research	14,021,100	270
Total, Pennsylvania	16,593,200	323

Location Programs	Estimated 1986 Dollars	Staff-Years
South Carolina		
Charleston - Research on plant productivity.....	1,794,800	42
Clemson - Research on commodity conversion and delivery.....	1,666,800	27
Florence - Research on soil and water conservation, and research on plant productivity.....	1,613,300	41
Total, South Carolina.....	5,074,900	110
South Dakota		
Brookings-Madison - Research on plant productivity...	1,462,100	35
Tennessee		
Greenville - Research on plant productivity, and research on commodity conversion and delivery.....	49,200	1
Jackson - Research on plant productivity.....	125,300	3
Lewisburg - Research on plant productivity and research on animal productivity.....	141,200	3
Total, Tennessee.....	315,700	7
Texas		
Beaumont - Research on plant productivity, and research on commodity conversion and delivery.....	733,500	16
Brownwood - Research on plant productivity.....	588,500	12
Bushland - Research on soil and water conservation, research on plant productivity, and research on animal productivity.....	2,093,000	39
College Station - Research on plant productivity, research on animal productivity, and research on commodity conversion and delivery.....	7,454,900	133
Houston - Human nutrition research.....	3,929,500	5
Kerrville - Research on animal productivity.....	2,252,000	55
Lubbock - Research on soil and water conservation, research on plant productivity, research on commodity conversion and delivery, and integration of agricultural systems.....	2,119,400	35
Temple - Research on soil and water conservation, research on plant productivity, and integration of agricultural systems.....	2,614,900	51
Weslaco - Research on soil and water conservation, research on plant productivity, research on commodity conversion and delivery, and integration of agricultural systems.....	5,116,700	118
Total, Texas.....	26,902,400	464
Utah		
Logan - Research on plant productivity, research on animal productivity, and research on commodity conversion and delivery.....	2,772,800	53
Virginia		
Suffolk (Holland) - Research on soil and water conservation, research on plant productivity, and research on commodity conversion and delivery.....	462,500	12

Location Programs	Estimated 1986 Dollars	Staff-Years
Washington		
Prosser - Research on soil and water conservation, and research on plant productivity.....	2,073,700	39
Pullman - Research on soil and water conservation, research on plant productivity, research on animal productivity, and research on commodity conversion and delivery.....	4,611,100	79
Wenatchee - Research on plant productivity, and research on commodity conversion and delivery.....	1,013,700	20
Yakima - Research on plant productivity, and research on commodity conversion and delivery.....	2,310,400	52
Total, Washington.....	10,008,900	190
West Virginia		
Beckley - Research on soil and water conservation...	1,985,700	20
Kearneysville - Research on soil and water conservation, research on plant productivity, and research on commodity conversion and delivery.....	3,066,100	24
Total, West Virginia.....	5,051,800	44
Wisconsin		
Madison - Research on plant productivity, research on animal productivity, and research on commodity conversion and delivery.....	4,597,300	45
Wyoming		
Cheyenne - Research on soil and water conservation, and research on plant productivity, and integration of agricultural systems.....	642,100	13
Laramie - Research on plant productivity, and research on animal productivity.....	1,877,500	54
Total, Wyoming.....	2,519,600	67
Puerto Rico		
Mayaguez - Research on soil and water conservation, and research on plant productivity.....	1,820,300	41
Virgin Islands		
St. Croix - Research on plant productivity.....	211,000	6
Foreign Countries		
Argentina, Buenos Aires - Research on plant productivity.....	208,100	1
France, Behoust - Research on plant productivity....	718,000	2
Guatemala, Guatemala City - Research on plant productivity	127,300	1
Italy, Rome - Research on plant productivity.....	494,200	2
Kenya, Mugana - Research on animal productivity.....	135,900	2
Korea, Seoul - Research on plant productivity.....	119,700	3
Mexico, Tuxtla Gutierrez - Research on animal productivity.....	884,800	9

Location Programs	Estimated 1986 Dollars	 Staff-Years
Netherlands, Rotterdam - Research on commodity conversion and delivery	300,700	2
Thailand, Chiang Mai - Research on plant productivity	148,100	1
Total, Foreign Countries	3,136,800	23
Contingency Research Fund	951,300	--
Extramural and Program Locations to be Determined	14,544,800	--
Repair and Maintenance of Facilities	10,551,900	--
Allotment to Forest Service	369,400	--
Total, Budget Estimate	478,080,100	8,158

Mr. WHITTEN. Also please provide for the record a table listing all ARS research facilities, including the percentage utilization of each facility as well as the staff assigned to the facility.

[The information follows:]

STATUS OF STAFFING OF AGRICULTURAL RESEARCH SERVICE FACILITIES
As of October 31, 1985
(Expressed in terms of scientific personnel)

Location	Total Capacity (Scientist)	Total in Use (Scientist)	Percent Staffed
Alabama:			
Auburn	13	13	100
Arizona:			
Phoenix	41	34	83
Tucson	31	22	74
California:			
Albany	181	159	88
Fresno	32	28	88
Pasadena	26	23	88
Riverside	40	40	100
Salinas	23	17	74
San Francisco	29	29	100
Shafter	12	11	92
Colorado:			
Akron	10	10	100
Ft. Collins	34	34	100
District of Columbia	27	27	100
Florida:			
Gainesville	59	59	100
Miami	11	7	67
Orlando	30	26	87
Winter Haven	20	14	70
Georgia:			
Athens	118	112	95
Byron	20	17	85
Dawson	14	8	57
Savannah	38	22	58
Tifton	30	28	93
Watkinsville	18	12	64
Idaho:			
Boise	13	10	77
Kimberly	28	23	82
Illinois:			
Peoria	180	161	89

Location	Total Capacity (Scientist)	Total in Use (Scientist)	Percent Staffed
Iowa:			
Ames	130	121	93
Kansas:			
Manhattan	47	23	49
Louisiana:			
Baton Rouge	10	9	90
Houma	11	9	82
New Orleans	150	129	86
Maryland:			
Beltsville	616	575	93
Frederick	26	22	85
Massachusetts:			
Boston	50	31	62
Michigan:			
East Lansing	13	13	100
Minnesota:			
Morris	15	10	67
Mississippi:			
Oxford	25	21	84
Mississippi State	37	37	100
Stoneville	50	44	88
Missouri:			
Columbia	17	14	82
Montana:			
Miles City	10	9	90
Sidney	11	4	36
Nebraska:			
Clay Center	67	37	55
New Mexico:			
Las Cruces	15	15	100
New York:			
Plum Island	44	35	80
Ithaca	18	17	94
North Carolina:			
Oxford	16	12	75
Raleigh	24	23	96

Location	Total Capacity (Scientist)	Total in Use (Scientist)	Percent Staffed
North Dakota:			
Fargo	60	54	90
Grand Forks	21	16	76
Mandan	24	22	92
Oklahoma:			
Durant	15	15	100
El Reno	17	9	53
Stillwater	15	14	93
Woodward	10	4	40
Oregon:			
Corvallis	11	11	100
Pendleton	15	14	93
Pennsylvania:			
University Park	30	24	80
Wyndmoor	170	135	79
Puerto Rico:			
Mayaquez	10	8	80
South Carolina:			
Charleston	14	13	93
Florence	14	8	57
South Dakota:			
Brookings	12	9	75
Texas:			
Bushland	29	21	72
College Station	55	48	92
Kerrville	24	17	71
Temple	33	27	82
Weslaco	51	31	61
Utah:			
Logan	22	19	86
Washington:			
Yakima	19	14	73
Wenatchee	15	9	60
West Virginia:			
Beckley	20	13	65
Kearneysville	20	20	100
Wisconsin:			
Madison	19	16	84
Wyoming:			
Cheyenne	17	7	41

Location	Total Capacity (Scientist)	Total in Use (Scientist)	Percent Staffed
Subtotal, (75 Locations with capacity of 10 or more scientists).....	3,242	2,754	85
All other locations (32 with capacity of less than 10 scientists).....	171	139	81
Total, Federal Facilities.....	3,413	2,893	85

Number of Non-ARS Scientists included above.....	363
Number of ARS Scientists included above:	
ARS Senior Scientists (GS-11 and above).....	2,245
ARS Junior Scientists (Below GS-11).....	285
Total.....	2,893

ENERGY RESEARCH CENTERS

Mr. WHITTEN. What is the current status of the energy research centers?

Dr. KINNEY. Energy research at Tifton, Georgia, and Peoria, Illinois, was heavily oriented toward the development of biomass energy and other alternative agricultural sources of energy. The technology visualized by these programs would not be feasible for commercial adoption under current economic conditions. As a result, an initiative began in FY 1985 to direct a portion of the biomass energy research to higher priority needs including energy conservation and production efficiency, groundwater quality, soil/water-crop conservation production systems, pest behavior and management, plant germplasm enhancement, new crops, and post-harvest quality enhancement of crop plants. ARS will continue to focus on production systems to improve production efficiency and reduce production energy costs. Within the biomass energy research area, ARS will continue support of some fundamental approaches to the conversion of crops to energy sources.

Mr. WHITTEN. Please describe the work carried out at each of these centers as well as the annual budget for both people and dollars.

Dr. KINNEY. At the Crop Systems Research Unit, Tifton, Georgia, formerly the Southern Agricultural Energy Center, $198,000 currently is allocated to renewable energy research. This research is conducted by extramural cooperators. Energy conservation research related to forage production, peanut production, and on-farm peanut processing is supported by $428,000 with 4.0 scientists. At the Oil Chemical Research Unit, Peoria, Illinois, formerly the Northern Agricultural Energy Center, the vegetable oil and hydrocarbon crops research is supported by $800,000, and 6.6 scientists.

NEW RESEARCH FACILITIES

Mr. WHITTEN. What laboratory space have you acquired during the past 12 months, and why was this space acquired?

[The information follows:]

During the past 12 months, construction projects have been completed which resulted in the acquisition of the following laboratory space:

Location	*Amount*
Livestock and Range Research Station, Miles City, Montana	840 s.f.
Fruit and Nut Germplasm Repository, Geneva, New York	585 s.f.
Beltsville Agricultural Research Center, Beltsville, Maryland	216 s.f.
South Central Agricultural Research Center, Lane, Oklahoma	500 s.f.

While additional construction contracts have been awarded during this period and construction is proceeding, occupancy of facilities has not yet taken place.

In addition, in August 1985, the Agency acquired, through a 5-year lease agreement, approximately 10,000 square feet of laboratory space at the University of Wyoming, Laramie, Wyoming, for establishment of the Arthropod Borne Animal Disease Research Laboratory.

Mr. WHITTEN. What laboratory space has been released during the past 12 months, and what was the purpose of the release?

Dr. KINNEY. Approximately 7,200 square feet of laboratory space as provided at the Denver Federal Center by the General Services Administration (GSA) has been released. Relocation to Laramie, Wyoming, was pursued due to results of a GSA Master Plan which

identified Agency operations as incompatible with future high-density office use. Moreover, existing facilities were not designed for animal disease research at an appropriate level of biological security.

PSEUDORABIES

Mr. WHITTEN. Would you please provide for the record a description of the research that you have underway on pseudorabies, indicating where the work is carried out and the number of people assigned to the work?

Dr. KINNEY. The in-house research program includes work on evaluation of the efficacy of thymidine kinase negative modified live virus—MLV—vaccine which has just been licensed. Also, ARS scientists at the National Animal Disease Center—NADC—are determining the optimal procedures for producing high levels of pseudorabies virus protective antibodies in colostrum. The new latex agglutination test for detecting antibodies to pseudorabies virus is being evaluated in the detection of seropositive swine. Feral wild pigs and the impact they may have on the spread of pseudorabies virus to domestic swine is also an in-house project at the NADC. The extramural program consists of three cooperative agreements, two at Iowa State University and one at Purdue University. Work at Iowa State University continues to be focused around diagnostic probes and the need to detect viral DNA in tissue samples. At Purdue University, work has focused on the detection of latency and use of certain antiviral drugs which may prevent it. The second project at Ames, Iowa, is with the pilot studies which are determining the best ways to clean up pseudorabies virus-infected herds. Approximately five scientists are supported by this budget.

Mr. WHITTEN. What is the budget for pseudorabies research for fiscal years 1985, 1986, and 1987?

Dr. KINNEY. Included in the ARS budget for research on pseudorabies for fiscal years 1985, $905,200; 1986, $861,100; and 1987, $899,800.

GUAYULE RESEARCH

Mr. WHITTEN. What research do you have underway on guayule, and please indicate the budget for fiscal years 1985, 1986, and 1987?

Dr. KINNEY. We have a balanced, limited guayule research program that is closely coordinated with guayule research conducted by Arizona, California, New Mexico, and Texas that is supported by CSRS and State funds. The guayule research is coordinated by the Guayule Administrative Management Committee whose members represent the Directors of the four State Agricultural Experiment Stations and ARS. As ARS research on guayule water requirements, salt tolerance, and environmental effects on rubber production is completed, we will be changing the emphasis of this research to guayule genetics and germplasm enhancement. Research on environmental effects on rubber quality in the plant and in the shrub during harvesting, bioregulation, and processing will be continued. The ARS budget for fiscal year 1985 was $1,376,000. The budget for 1986 was $1,233,000 and 1987 is $1,288,200.

CATFISH RESEARCH

Mr. WHITTEN. Would you please provide for the record a description of all work carried out by ARS in the field of catfish research?

[The information follows:]

ARS is doing research at the Southern Regional Research Center (SRRC), New Orleans, Louisiana, to identify constitutents responsible for warmed-over flavor in meat, poultry, and fish; determine their mechanisms of formation; and design procedures for their prevention. The fish portion of this project is processed catfish. A second project at the SRRC is to determine ecological causes of off-flavors in catfish. This project deals with the pond environment. At the Regional Parasite Research Laboratory, Auburn, Alabama, research is designed to characterize the leukocyte function and its regulatory control in catfish to improve immunity from diseases and parasites. At Stoneville, Mississippi, 1986 funds have been approved to initiate a program of research in catfish breeding and genetics. Most of FY 1986 and 1987 funds will be used for development of facilities. The research will be cooperative with Mississippi State and other Agricultural Experiment Stations. A small project in cooperation with the Fish and Wildlife Service on catfish management will be initiated at Tishomingo, Oklahoma, in 1986.

Mr. WHITTEN. Please provide the amount of funds devoted by ARS to catfish research for fiscal years 1986, 1986, and 1987, by location.

[The information follows:]

The following amounts are included in the ARS budget for catfish by location for fiscal year 1985—New Orleans, LA $357,700; Auburn, AL $26,400; fiscal year 1986—New Orleans, LA $339,600; Auburn, AL $25,100; Stoneville, MS $475,600; fiscal year 1987—New Orleans, LA $354,900; Auburn, AL $26,200; Stoneville, MS $497,000.

CORN CYST NEMATODE

Mr. WHITTEN. What research do you have underway on corn cyst nematodes, and what is the annual budget for fiscal years 1985, 1986, and 1987?

Dr. KINNEY. ARS has developed methods to culture the corn cyst nematode on sterile artificial media and is currently comparing this nematode with other better known parasitic nematodes by determining the genetics of the nematodes via their enzymes. This research will be complete in 1986. The budget for 1985 is $18,000 and for 1986 is $9,600. No funding is planned for 1987.

GRASSHOPPERS

Mr. WHITTEN. What research is carried on by ARS in the control of grasshoppers?

Dr. KINNEY. ARS has a broad program on grasshopper control that includes the development of pathogens including fungi, microsporidia, and viruses. The objective of this research is to develop cost-effective technology for preventing economic infestations of grasshopper on rangeland.

Mr. WHITTEN. What funding is devoted to grasshopper research for fiscal years 1985, 1986, and 1987 by location?

[The information follows:]

GRASSHOPPER AND MORMON CRICKET RESEARCH

Location	Fiscal year—		
	1985 estimated	1986 estimated	1987 estimated
Ithaca, New York	222,800	212,000	221,500
Bozeman, Montana	666,600	634,400	662,900
Total	889,400	846,400	884,400

ARS OVERSEAS LOCATIONS

Mr. WHITTEN. Would you please list for the record all locations at which ARS personnel are stationed overseas, describing the work carried out at that location and the annual budget for the facility?

[The information follows:]

The overseas activities of ARS are carried out at 9 locations as follows:

Buenos Aires, Argentina—The mission of the Biological Control of Weeds Laboratory is to search for and test biological agents in southern South America and ship them to the United States to control weed and insect pests. Staffing includes one (1) Foreign National scientist. There is currently no ARS U.S. scientist at this location. The annual budget is $208,100.

Behoust, France—The mission of the European Parasite Laboratory is to locate, collect, culture, evaluate and ship to the United States those natural enemies of U.S. insect pests of foreign origin. Staffing includes two (2) ARS U.S. scientists and nine (9) Foreign National employees. The annual budget is $718,000.

Guatemala City, Guatemala—The mission of the Medfly Research Unit is to produce biologically and environmentally sound methods of detection, prevention, exclusion, and control/eradication of pests of tropical and subtropical fruits and vegetables in the U.S. from the crop to the consumer. Staffing includes one (1) ARS U.S. scientist. The annual budget is $127,300.

Rome, Italy—The mission of the Biological Control of Weeds Laboratory is directed towards the development of biological control of U.S. weeds of foreign origin, utilizing parasites, predators or pathogens for weed control. Staffing at this location includes two (2) ARS U.S. scientists and seven (7) Foreign National employees. The annual budget is $494,200.

Muguga, Kenya—The mission of the Animal Disease Laboratory includes research to develop resistance and protection against parasites causing diseases in cattle and other ruminants. Staffing includes one (1) ARS U.S. scientist and one (1) Foreign National employee. The annual budget is $135,900.

Seoul, Republic of Korea—The mission of the Asian Parasite Laboratory is to locate, identify, study and export for utilization in Stateside research programs those natural enemies having a potential for use against U.S. insect pests. Staffing includes one (1) ARS U.S. scientist and one (1) Foreign National employee. The annual budget is $119,700.

Tuxtla Gutierrez, Mexico—The mission of the Screwworm Research Laboratory is to provide basic and applied research for the screwworm eradication program. Staffing includes six (6) ARS U.S. scientists and five (5) Foreign National employees. The annual budget is $884,800.

Rotterdam, the Netherlands—The mission of the European Marketing Research Center is to provide research that will contribute to more efficient marketing of U.S. agricultural products in Europe. Staffing includes two (2) ARS U.S. scientists and three (3) Foreign National employees. The annual budget is $300,700.

Chiang Mai, Thailand—The mission of the Crop Substitution Program is to determine which agricultural enterprise will best replace income lost by suppression of opium production. Staffing includes one (1) ARS U.S. scientist and one (1) Foreign National employee. The annual budget is $148,100.

SMALL GRAINS RESEARCH PROGRAM

Mr. WHITTEN. Would you please describe the small grains research program at Beltsville and its accomplishments?

Dr. KINNEY. Small grain research at Beltsville involves two major activities—maintenance/evaluation of the USDA Small Grain Collection; and—research on small grain pathology and genetics.

Two scientists are involved in the maintenance and evaluation of the USDA Small Grain Collection. This collection contains more than 100,000 unique samples of wheat, oats, barley, rice, rye, and related species and it is the single most utilized active collection within the National Plant Germplasm System. Seed samples and evaluative data are made available to plant scientists throughout the world.

The small grain pathology and genetics research has resulted in improved resistance to fungal diseases of barley and wheat and a better understanding of the genetic basis for resistance. Three scientist positions are associated with this activity. The emphasis for this research effort will shift toward the identification of moloecular phenomena controlling the expression of resistance to fungal diseases of wheat and barley.

RESEARCH ON CHERRIES

Mr. WHITTEN. Would you please provide for the record a description of and a history of your research work on cherries?

[The information follows:]

At the present time, we conduct cherry research at Davis, California; East Lansing, Michigan; Wenatchee, Washington; Yakima, Washington; and Kearneysville, West Virginia. The research consists of genetic improvement; control of virus diseases; biology and control of fungal diseases, insects, and mites; chemical and nonchemical control of postharvest disorders; improving techniques in cooling, handling, packing, storing, and shipping tree fruits; new and improved technology in handling and transporting fresh fruit; fruit quality affected by environment, handling, and storage conditions; and quality maintenance of mechanically harvested fruit.

Mr. WHITTEN. What is the level of funding for fiscal years 1986 and 1987?

[The information follows:]

The level of funding for cherry research since fiscal year 1976 is as follows: 1976—$165,000; 1977—$244,000; 1978—$252,000; 1979—$252,000; 1980—$252,000; 1981—$278,000; 1982—$294,000; 1983—$247,000; 1984—$258,000; 1985—$258,000; 1986—$202,000; and 1987—$211,100.

A-76 REVIEWS

Mr. WHITTEN. Are you proposing to conduct any A-76 reviews in fiscal years 1986 or 1987?

Dr. KINNEY. Yes, the Agricultural Research Service plans to conduct three A-76 reviews in FY-86 and two in FY-87.

Mr. WHITTEN. What locations are under consideration for this type of review?

[The information follows:]

The following ARS locations are scheduled for review in FY-86 and FY-87:

Locations

Name:	Beltsville Agricultural Research Center
Location:	Beltsville, Maryland
Next Review:	FY-86
Function:	Facilities Support
Name:	U.S. National Arboretum
Location:	Washington, DC
Next Review:	FY-86
Function:	Facilities Support
Name:	Western Regional Research Center
Location:	Albany, California
Next Review:	FY-86
Function:	Facilities Support
Name:	National Animal Disease Center
Location:	Ames, Iowa
Next Review:	FY-86
Function:	Facilities Support
Name:	Southern Plains Area
Location:	College Station, Texas, and Weslaco, Texas
Next Review:	FY-87
Function:	Facilities Support

RESEARCH ON WALNUTS

Mr. WHITTEN. Would you please provide a description of and history of your research on walnuts?

Dr. KINNEY. With a program increase of $50,000 in fiscal year 1978 and an additional $150,000 in fiscal year 1979, we have been able to initiate an excellent walnut research program at Davis, California, which is cooperative with the University of California. The blackline disease is the number one problem of the U.S. walnut industry and affects about 27 percent of the acreage. ARS research has shown that this serious disease is caused by cherry leafroll virus and is pollen and seed transmitted. This was a major breakthrough and allows for disease control. The current research program emphasizes improved detection and control procedures for walnut blackline and other virus diseases; identification and control of Phytophthora and other soilborne diseases associated with irrigation practices; development of scion and rootstock varieties for different soils and production areas; evaluation of walnut varieties and species for potential use in the walnut improvement program; and preservation of walnut germplasm as a part of the National Clonal Germplasm Repository System.

Mr. WHITTEN. What is the funding level for fiscal years 1986 and 1987?

[The information follows:]

The level of funding for walnut research since fiscal year 1977 is as follows: 1977-$16,000; 1978-$78,000; 1979-$228,000; 1980-$243,000; 1981-$273,000; 1982-$257,000; 1983-$273,000; 1984-$279,000 1985-$279,000; 1986-$202,000; and 1987-$211,100.

AIRCRAFT

Mr. WHITTEN. Please provide for the record a listing of aircraft owned by the Agricultural Research Service, showing where the aircraft are located, the types of aircraft, and how the aircraft were acquired. Also indicate for the record the number of flying hours used by each of these aircraft during fiscal year 1985.

[The information follows:]

Location: College Station, Texas
Type: Cessna, P206B
Acquisition: GSA excess
Flying Hours: 59

Location: College Station, Texas
Type: Cessna, T-188C
Acquisition: Purchased
Flying Hours: 21

Location: College Station, Texas
Type: Bell Helicopter
Acquisition: Purchased
Flying Hours: 4

Location: College Station, Texas
Type: Cessna, 206B
Acquisition: GSA excess
Flying Hours: 48

Location: Weslaco, Texas
Type: Cessna, 182
Acquisition: GSA excess
Flying Hours: 111

Location: Weslaco, Texas
Type: Aero Commander
Acquisition: GSA excess
Flying Hours: 90

Location: Weslaco, Texas
Type: Cessna, TU 206G
Acquisition: GSA excess
Flying Hours: 20

INTERAGENCY TASK FORCE ON YAZOO BASIN FOOTHILLS EROSION AND FLOOD CONTROL

Mr. WHITTEN. Please provide for the record a status report on the Interagency Task Force on Yazoo Basin Foothills Erosion and Flood Control Project.

[The information follows:]

Because of a critical need for a systematic watershed erosion and flood control program, Congress has directed the Corps of Engineers and the Soil Conservation Service to establish the Demonstration Erosion Control (DEC) Project in the Yazoo Basin. Congress has also directed the Agricultural Research Service to collaborate in the DEC Project through the National Sedimentation Laboratory. All of the research at the Laboratory is relevant to the DEC Project, and the various research programs there are being coordinated and focused by the Sedimentation Laboratory Technology Applications Project (TAP). In FY 1985 TAP was funded in the amount of $350,000 recurring funds plus $1,400,000 for facilities expansion. The FY 1986 TAP funding is $570,000 after Gramm-Rudman-Hollings reductions and other congressionally mandated reductions. TAP is presently staffed with a full-time Project Coordinator and the half-time services of a Hydraulic Engineer, a Soil Scientist, and an Ecologist, plus a full-time Ecologist Research Associate and two full-time Hydrologic Technicians. Another Hydraulic Engineer and another Technician will be added in FY 1987. The mission of TAP is to support DEC by (a) field reconnaissance and photogrammetric watershed erosion and flood damage assessment; (b) improved watershed data analysis for evaluating remedial technology effectiveness; and (c) watershed model application for projecting benefits of proposed remedial technology. As of March 1986, TAP has completed field reconnaissance and channel condition

review for all major streams in all six DEC watersheds except for Fannegusha Creek, which will be completed in a month. Ecological surveys have been completed for all watersheds. Computer programs for watershed data storage and analysis are being developed, and drainage net data for Otoucalofa Creek Watershed has been entered in the system. Photogrammetric terrain analysis equipment for watershed assessment has been ordered, and ground-penetrating radar equipment for channel bank stability determination has been procured. Work on the needed building expansion at the National Sedimentation Laboratory was started according to schedule in February 1986, and is continuing on schedule.

NATIONAL ARBORETUM

Mr. WHITTEN. What are the planned expenditures for the National Arboretum for fiscal years 1986 and 1987.

Dr. KINNEY. Funds available to the National Arboretum for fiscal year 1986 is $3,429,100 and the estimated for fiscal year 1987 is $3,583,200.

DAIRY FORAGE

Mr. WHITTEN. Would you please provide for the record a description of ARS research efforts in dairy forage and state the planned expenditures for fiscal years 1986 and 1987?

[The information follows:]

There are 17 scientists working on dairy forage research. U.S. Dairy Forage Research Center (USDFRC) is currently funded to support 11 scientists at Madison. There are 9 scientists presently employed at Madison and two additional scientists will be hired in the near future. Dairy forage research projects include: developing ways to improve rumen fermentation and digestion of protein, fiber and other forage cell wall components; developing methods to improve the utilization of silage; developing methods to improve forage harvesting and reduce harvest losses and to improve the nutritional value of forage and evaluate forage quality either through genetics, increasing availability of soil nutrients, or through postharvest evaluations.

These efforts are providing the information that is needed to improve production efficiency through more effective use of forages for dairy production. This is important as feed costs represent over 50% of the cost of producing milk. The planned expenditures in thousands of dollars for 1986 and 1987 for the (USDFRC) at Madison, Wisconsin and its seven cluster locations are as follows:

[In thousands]

	1986	1987 estimated
Madison, WI	$2,180	$2,278
Ithaca, NY	115	120
University Park, PA	115	120
Wooster, OH	114	119
Columbia, MO	137	143
Ames, IA	126	132
St. Paul, MN	239	250
East Lansing, MI	124	130
Total	$3,150	$3,292

PEACH RESEARCH

Mr. WHITTEN. Please describe for the record the research ARS is conducting on peaches and state the planned expenditures for fiscal years 1986 and 1987.

[The information follows:]

There is peach research at Fresno, California; Byron, Georgia; Beltsville, Maryland; East Lansing, Michigan; Lane, Oklahoma; Wenatchee, Washington; Yakima, Washington; and Kearneysville, West Virginia. Research emphasis is placed on germplasm evaluation and variety improvement; rapid methods of asexual propagation; cold hardiness research; effect of nutritional balance and stress on fruit quality; biology and control of peach insects, diseases, and nematodes; integrated pest management systems; non-chemical control of post-harvest peach diseases; new production systems for mechanical harvesting; new concepts of fruit mechanization; improved cultural practices; biochemical mechanisms affecting fruit ripening and quality; physiology of growth, flowering, and fruit production; study of growth regulating chemicals; and improved cultural practices. Planned level of funding is $1,583,700 in fiscal year 1986 and $1,654,900 in fiscal year 1987.

CATFISH BREEDING

Mr. WHITTEN. Please describe for the record the research ARS is conducting on catfish, including the catfish-breeding program, and the expenditures for these programs in FY 1986 and 1987?

[The information follows:]

ARS is doing research at the Southern Regional Research Center—(SRRC), New Orleans, Louisiana, to identify constituents responsible for warmed-over flavor in meat, poultry, and fish; determine their mechanisms of formation; and design procedures for their prevention. The fish portion of this project is processed catfish. A second project at the SRRC is to determine ecological causes of off-flavors in catfish. This project deals with the pond environment. At the Regional Parasite Research Laboratory, Auburn, Alabama, research is designed to characterize the leukocyte function and its regulatory control in catfish to improve immunity from diseases and parasites. At Stoneville, Mississippi, 1986 funds have been approved to initiate a program of research in catfish breeding and genetics. Most of 1986 and 1987 funds will be used for design and construction. Architectural-engineering and construction contracts will include the following: Design of the overall facility including layout of pools, wells, hydrological systems, roads, water storage/transfer tanks, levees, drainage and topography features; design of the prefabricated metal building, utility systems, emergency generator and associated ancillary systems, construction of the ponds, wells, hydrological systems, service roads, water storage/transfer tanks, levees, drainage systems, emergency generator and ancillary facilities, and associated topography features; and construction of the prefabricated metal building and its interior amenities. Two wells will be required to supply water for the facility. One well for the ponds at a depth of approximately 100–300 feet supplying water with a mean temperature of 63° at a recovery rate of 2000 GPM, another for the building's interior holding tanks (approximately 128 each) supplying water with a mean temperature of 82° to 85° at a depth of approximately 1,100 feet. These wells will be drilled this fiscal year. We estimate that the acquisition of both architectural-engineering designs, drilling the wells, and the award of a contract for construction of the prefabricated metal building and the electrical system can be accomplished this fiscal year. The construction of the ponds and hydro system will be deferred until FY 1987. The research will be cooperative with Mississippi State and other Agricultural Experiment Stations. Funding for FY 1986 is $840,300; FY 1987—$878,100.

TRIFLY RESEARCH

Mr. WHITTEN. Please describe the research ARS is conducting to develop means of eradicating the trifly infestation in Hawaii and provide the planned expenditure for fiscal year 1986 and 1987.

Dr. KINNEY. ARS is conducting research to improve the effectiveness and to reduce costs of eradication technology for three species—Mediterranean fruit fly, oriental fruit fly, and melon fly. Such research includes genetic engineering that will allow release of sterile males only; development of new or improved attractants and baits; understanding fly population, behavior, and ecology; and development of new or improved eradication strategies. The levels of funding for FY 1986 and 1987 at the Honolulu and Hilo, Hawaii laboratories are $1,908,500 and $1,994,300, respectively.

SUNFLOWER RESEARCH

Mr. WHITTEN. Please provide a description of the research on the banded moth and other moths harmful to sunflowers, and provide the planned expenditures for FY 1986 and 1987.

Dr. KINNEY. ARS initiated a research project in FY 1986 at Fargo, North Dakota, on the control of the banded sunflower moth and other moths harmful to commercial sunflowers. Field and laboratory studies have been initiated to formulate effective insect control procedures including insecticides, modified cultural practices, trapping, and use of parasites. Planned expenditures are $95,100 in FY 1986 and $99,400 in FY 1987—to be used to fund a specific Cooperative Agreement with North Dakota State University to conduct this research.

[Additional information follows:]

SUNFLOWER RESEARCH

Location	1986 estimated	1987 estimated
Ames, Iowa	149,100	155,800
Bushland, Texas	197,500	206,400
Dawson, Georgia	2,000	2,100
Fargo, North Dakota	577,300	603,200
Madison, Wisconsin	34,100	35,600
Mississippi State, Mississippi	14,700	15,400
Peoria, Illinois	26,800	28,000
Total	1,001,500	1,046,500

FRUIT RESEARCH

Mr. WHITTEN. Please describe the research being conducted on postharvest, insect biology, and pest management at Wenatchee and Yakima, Washington. Please also provide the planned expenditures for fiscal years 1986 and 1987.

Dr. KINNEY. Postharvest fruit research at Wenatchee, Washington, is directed to effect of production practices on postharvest fruit quality, controlled atmosphere storage conditions to maintain fruit quality during extended periods of storage, improved handling and packaging of fruit for domestic and export shipments, and identification of physical and biochemical factors that determine fruit maturity and fruit quality during storage. Planned level of postharvest funding at Wenatchee is $410,900 in fiscal year 1986 and $429,400 in fiscal year 1987.

Research at Yakima, Washington, includes improved postharvest quarantine treatments for insects and diseases so as to encourage fruit exports; studies on pesticide residues on fruit and vegetables to include persistence in soil, level of toxicity, and degree of environmental pollution; chemistry and biology of insect pheromones; ecology, biology, and control of insect pests of horticultural crops; fruit irradiation studies for export fruit shipments; and integrated pest management systems. Planned level of entomology funding at Yakima is $2,310,400 in fiscal year 1986 with $2,414,200 planned for fiscal year 1987.

FRUIT FLY ATTRACTANT RESEARCH

Mr. WHITTEN. Please describe the research being conducted on the Caribbean fruit fly attractant and provide the planned expenditures for FY 1986 and 1987.

Dr. KINNEY. Scientists at the Insects Attractants Laboratory, Gainesville, Florida, are conducting research on the identification and synthesis of the Caribbean fruit fly sex pheromone. It is planned that this pheromone will be incorporated into a lure for fruit fly trapping and control purposes. A pheromone blend will be field tested on wild fruit fly populations in 1986 and 1987. The funding level will be $76,600 in 1986 and $80,000 in 1987.

HOPS RESEARCH

Mr. WHITTEN. Please describe the research being conducted on hops and provide the planned expenditures for fiscal years 1986 and 1987.

Dr. KINNEY. At Corvallis, Oregon, we have a research program on germplasm maintenance, germplasm evaluation, and development of new improved varieties. This reseach is cooperative with Washington State University, Pullman, Washington. Planned level of funding in fiscal year 1986 is $191,000 and $199,600 in fiscal year 1987.

LEAFY SPURGE

Mr. WHITTEN. Please describe the research being conducted on leafy spurge and provide the expenditures for fiscal years 1986 and 1987?

Dr. KINNEY. Research expenditures for FY 1986 total $604,500, with a planned expenditure of $631,700 for FY 1987. Research is conducted on the biology and ecology of the leafy spurge complex and development of integrated systems for control, including chemicals, insects, and pathogens. In 1985, ARS released two insects, a root feeding beetle and a stem-tip-gall fly for leafy spurge control. These insects are expected to provide only partial control. Biocontrol of leafy spurge will not be available for several years and may require a combination of several insects and pathogens. Additional work is being conducted on stem fungi, root nematodes, and a shoot tip moth.

RICE RESEARCH

Mr. WHITTEN. Please provide a description of the research being conducted on rice and provide the planned expenditures for FY 1986 and 1987.

Dr. KINNEY. Rice research includes production methodologies, protection from weeds, insects and diseases, genetic improvement, quality analysis, stored-product preservation, and utilization. The estimated level of funding for rice research in FY 1986 is $2,392,500 and $2,650,000 for FY 1987.

INTEGRATED PEST MANAGEMENT

Mr. WHITTEN. Please describe the research being conducted on integrated pest management, including the yellow star thistle and provide the planned expenditures for FY 1986 and 1987.

Dr. KINNEY. Research on integrated pest management by ARS includes a broad area of pest problems. Projects include control of insects, plant pathogens, and weeds. Integrated pest management research expenditures for FY 1986 total $9,508,000, with $9,935,000 planned for FY 1987. ARS is continuing the research program on yellow star thistle totaling $181,800 in FY 1986 and $190,000 in FY 1987, with inhouse research at Albany, California, on biological control of yellow star thistle and a supporting cooperative agreement with the University of Idaho. ARS scientists have recently released a seedhead weevil for yellow star thistle control that has become established in two areas in California. In addition, a seedhead fly has also been released. Other biocontrol agents currently under evaluation include a soil fungus and several species of root knot nematodes. Research is also underway on the biology of yellow star thistle including seedbank depletion, seed longevity, and distribution.

PEA AND LENTIL RESEARCH

Mr. WHITTEN. Please describe for the record the research being conducted on peas and lentils and provide the planned expenditures for fiscal years 1986 and 1987.

[The information follows:]

The primary emphasis of our pea and lentil research programs is to collect, evaluate, and maintain germplasm and introduce genetic lines and/or new varieties with improved pest resistance, nutritional quality, and market quality characteristics. In addition, there is research on determining nutritional characteristics and human bioavailability of nutrients in germplasm lines and varieties; biology, ecology, and control of insect pests; biology and control of disease and weed pests; use of peas and lentils in conservation tillage systems; and cooperative research with the University of Idaho, Moscow, Idaho, on biology and control of lygus bug. Planned expenditure for pea and lentil research is $823,000 in fiscal year 1986 and $860,000 in fiscal year 1987.

Mr. WHITTEN. Please also provide the same information for research being conducted on the lygus bug.

[The information follows:]

There is a limited amount of inhouse research at Yakima, Washington, on biology and ecology of the lygus bug and we have an extramural research project with the University of Idaho, Moscow, Idaho on the biology of control of the lygus bug. Planned funding is $36,300 in fiscal year 1986 and $37,900 in fiscal year 1987.

BIOLOGICAL CONTROL

Mr. WHITTEN. Please describe the research being conducted on the biological control of pests and provide the planned expenditures for fiscal years 1986 and 1987.

Dr. KINNEY. More than 20,000 species of agricultural pests, including insects, weeds, nematodes, and plant pathogens cause losses amounting to more than $12 billion annually in the United States. The discovery, importation, and utilization of biological control agents are important tools in management of these pests. The use of natural enemies to control pests represents an effective

means of increasing production efficiency and contribute directly to the stability of the agricultural economy while reducing adverse impacts upon the environment.

ARS has active biological control research programs in 23 locations with thrusts in the primary areas of insects, weeds, nematodes and plant pathogens. Our scientists are developing new methods for evaluation and implementation of biocontrol agents. We plan to maintain and increase our current research programs in biocontrol as new technologies should enable us to produce more efficient, effective biocontrol agents. Funding levels for the ARS biological control research program for 1986 and 1987 are $5,559,500 and $5,809,300, respectively.

LESSER CORNSTALK BORER, MOLE CRICKET, AND DIAPREPES

Mr. WHITTEN. Please describe for the record the research being conducted on the lesser cornstalk borer, the mole cricket and diaprepes, and provide the planned expenditures for FY 1986 and 1987.

[The information follows:]

ARS has a research program to determine the population dynamics of the lesser cornstalk borer in soybeans, peanuts, corn, sorghum, and wheat. Survey and detection of the adults of the lesser cornstalk borer are being accomplished with the utilization of pheromone and traps. Cooperative research is being conducted to develop a lesser cornstalk borer prediction model based on soil moisture, temperature, and adult abundance. Research is also being conducted to determine the pathogenicity of *Bacillus thuringiensis* to the lesser cornstalk borer and to evaluate efficacy of this bacterium and the granulosis virus in the field. ARS research on mole crickets have been directed towards the biological control as well as biological and behavioral studies of this pest. Additional studies on development of methods to laboratory-rear mole crickets, create a bait for control, and parasitic nematodes are being continued.

Planned expenditures for FY 1986 and FY 1987 are $434,600 and $454,200, respectively.

ARS research on diaprepes is to develop an effective management strategy for this pest. Studies on the characterization of pheromones, dietary requirements for improvement of rearing methods, reproductive biology, and development of improved methods to infest soil with an exotic antagonist for biocontrol strategies are currently being investigated. Planned expenditures for FY 1986 and FY 1987 are $272,100 and $284,300, respectively.

TROPICAL/SUBTROPICAL RESEARCH

Mr. WHITTEN. Please describe the tropical and subtropical research being conducted by ARS under section 406 of the Agricultural Trade Development Assistance Act and provide the planned expenditures for fiscal years 1986 and 1987.

Dr. KINNEY. There is research in Hawaii on the development of improved quarantine treatments to insure that marketed tropical fruits are free of insect pests. In Puerto Rico, emphasis is on germplasm evaluation and improved variety development of tropical crops, improved production and cultural practices, and educational and training programs. Planned funding is $699,300 in fiscal year 1986 and $730,600 in fiscal year 1987.

HELIOTHIS

Mr. WHITTEN. Please describe the research being conducted to control the Heliothis complex and provide the planned expenditures for fiscal years 1986 and 1987.

Dr. KINNEY. ARS research on the Heliothis complex is conducted by 47 scientist-years at 24 ARS laboratories. Research thrusts include population ecology, biological control, host plant resistance, chemical and cultural control, and genetic and behavioral control. Planned expenditures for 1986 are $5.9 million and $6.2 million in 1987. .

Mr. TRAXLER. Mrs. Smith.

Mrs. SMITH. Thank you, Mr. Chairman.

And thank you, Dr. Bentley and Dr. Kinney. We are happy to have you here. We always feel uplifted as we hear all of the good things that you are doing, and I am delighted to have these new products. You know, the last time you came, you brought pecans, and I am so glad you have some more. [Laughter.]

I went home one night and put some pecans in a dish. I am just going to eat some right now, I am so hungry. So I go over and the dish is empty, and my husband said they were so good I ate them all. So I am glad you have some more.

NEW TALENT

Let me ask you this. With your current budget and activities, do you feel that you can maintain the rich expertise that you already have, and attract new talent?

Dr. KINNEY. If I might comment, Mrs. Smith, yes, that is one of the things that we are doing in ARS, because we are concerned about talent for the future. The sort of biotechnology that the Chairman referred to, that is going to be so important.

POST DOCTORAL STUDENTS

We have in ARS this year about 300, either visiting scientists, research associates, graduate students, or if you will, postdoctorate student employees. The program is administered at headquarters. We have expanded this program over the past four years. This will be our fifth year, and we are going to be hiring 100 research associates. They will be primarily postdoctoral students, and they will be hired in a very unique way. We do not go out and just look for bright students.

We develop research proposals. We select those high priority proposals and we tell the laboratory that, yes, we will support a scientist for that project from headquarters. And then we go looking for the best possible individual to do the best possible research.

So it is the best of both worlds. This has not been in effect long enough to evaluate it, but over time we are sure that we are going to be able to hire some top notch scientists out of this research associate program. So that is one area that we are spending quite a bit of time and money on.

Incidentally, I should say that we are paying these people a high enough salary in order to get the best. So we are competing with MIT, Harvard, and Stanford, as well as in the Land Grant System.

COMMODITY CONVERSION AND DELIVERY

Mrs. SMITH. That is a very interesting answer. I notice that you have provided for a 14 percent increase in commodity conversion and delivery, the highest increase of any of your Department, and I am very glad of that. I was reading here in your material what you use it for, and you use this for dairy products, you use this for grain products, new biodegradable food packaging, lightly processed food, and so on.

You know, out in our agricultural area, where we know there is not the demand for wheat and corn that there used to be, we have a great interest in processing foods, and in research to add more value to our products.

I shared with all of my colleagues here packages of Cornhusker All-Stars, a new corn cereal that was developed with the help of our State University Research Center, and getting very popular out there.

We have, in one area, dropped the crops that we have always raised. We are raising onions and carrots for Campbell's Soup, a new venture. We have, in one of our big wheat counties, a new program for making flour and gluten, and hopefully using right there all the wheat that we produce in that county.

So I am much interested in the fact that you are expanding this program, and we will be very much interested in looking to you for help as we develop our new food Researching Processing and Marketing Center in Nebraska. And I wanted to ask you, are there any studies that show that centers like this, in an area where we have the commodities, and are producing them, that are economically beneficial and advantageous?

Dr. KINNEY. Well, I think that the best example that pops into mind immediately, well, three, but one in particular, is our Regional Research Center in Peoria, Illinois. Obviously in the heartland of agricultural production and agricultural surpluses, I might say. They have a long history, since 1940, of doing things like finding new uses for starch, linseed oil, when the flax industry was changing around, and soybeans and soybean oil, and so forth.

So I would say yes, it will get support in those sort of appointments.

ORGANIC FARMING

Mrs. SMITH. You were speaking, Dr. Bentley, about more efficient use of water, and more efficient use of fertilizer. We are hearing lots now about pesticide and nitrate contamination, and have become a very health conscious country. Do you folks do anything in the way of research on organic production?

Dr. BENTLEY. Yes, I would just make an overview statement on this. We look at the research and the biotechnology, where we are looking to try to impart into a plant a greater tolerance for insect tolerance and disease tolerance, as a way of making, not necessarily eliminating chemicals, but making more effective use of them, as to augment the natural systems.

And that is one of the major areas I think we are going to be looking at in research, so the basic research is not necessarily di-

rected towards organic harmony, but could be used in this regard, in this connection.

Moreover, one of the real challenges to agriculture in the future is to look at the matter of cost and productivity, and reducing costs as ways of making the product more competitive, and if that can be a factor of least resistance or biological stress, and so forth, be introduced into a plant, and you can do it through genetic mechanisms, that is usually cheaper and less costly than other ways.

So that is one area. Another area that we are looking at, another way of expressing what we are doing now is in the area that would be applicable to our organic farming, we had a study made through the Cooperative State Research Service, we had a study conducted at Iowa State, to take a look at all of the research projects that are carried out, and this was in ARS, and the State Agricultural Experiment Stations, and it was estimated that something over $24 million worth of research was being done, can be saved and be directly applicable to organic farming.

Now, it is very hard to define, because one does not know what will be useful under one set of conditions, but there is a great deal of effort, and as I say, that is a major thrust of a lot of the research that is being done, is to make more effect here, well, reduce the amount of herbicides and other chemicals that might be needed for controlling insects and diseases, and then hence would be useful, in this direction.

PLANT GENE EXPRESSION CENTER

Mrs. SMITH. I am much interested in what you say about these plant varieties that are more disease and insect resistant. Out in our area some folks who have irrigation are turning to dry land corn because pumping the water is so very expensive.

What is the status of the Plant Gene Expression Center?

Dr. KINNEY. Mrs. Smith, just a few weeks ago I met with the science advisory group that we appointed to the National Academy of Sciences in Berkeley, and that laboratory will be, the construction will be completed this year. We are in the process now of recruiting for a scientific director. And at the same time we are preparing job descriptions, and advertisements for the rest of the scientific components. So it is right on schedule. We expect it to be operational by this time next year.

Mrs. SMITH. That is very interesting. Mr. Chairman, I have no further questions.

CUCUMBER

Dr. BENTLEY. I happen to have a news release here that I would like to give you. It just came in the other day. It says a cucumber that stays sweet while it fights off insects and plant diseases has been developed by the U.S. Department of Agriculture and the University of Nebraska.

It has nothing to do with your particular question, but it so happens I had it here, and it is an interesting thing.

Mrs. SMITH. Well, I am glad to know about it. Go ahead and share it.

Dr. BENTLEY. It represents the kind of thing that we are talking about, because cucumbers are very susceptible to disease problems.

Mrs. SMITH. Yes, and I have a constituent who is putting his land into cucumbers now. He thinks that is the newest and best thing, so maybe this variety will help him.

Thank you very much.

Mr. TRAXLER. As an aside, before I recognize our distinguished colleague from Oklahoma, you know, Mrs. Smith, you and I share a lot of commonalities in our districts, and I want you to know that for many years we have been cucumber producers, and we are very pleased to welcome you to the—vine. In other words, you are in a pickle, also.

[Laughter.]

Mr. TRAXLER. Our distinguished colleague from Oklahoma, Mr. Watkins.

BRUCELLOSIS RESEARCH

Mr. WATKINS. Thank you, Mr. Chairman.

Dr. Bentley, Dr. Kinney and staff, welcome. It's always good to have you here, and I apologize for being a little late. I did enjoy hearing part of your testimony.

I am interested in what you are doing. I want to commend your efforts in the area of brucellosis research. As you well know, or you may not know, that Oklahoma is under a threat of a quarantine by APHIS. As I have been very closely associated with brucellosis for many years, I would like to have it cleaned out.

I think through ARS we are on the right track by trying to develop a cure or vaccine. I understand your agency is making headway in that area, and I would like an update on what progress is being made.

I know there is a very cooperative effort going on between Iowa and Oklahoma in field testing. This committee has provided funding to move in that direction.

Would either one of you like to elaborate on the status of the brucellosis research for a new vaccine?

Dr. KINNEY. Mr. Congressman, I cannot give you a very clear prognosis on the development of a vaccine. But our people at the National Animal Disease Center are working, as you know, diligently on one, and we are quite optimistic that there will be an improved vaccine in time.

In the meantime, we know that there are problems other than just a vaccine. There is a problem of diagnosis, and so forth. The field testing work that we have done in the past year with the Kerr Foundation has demonstrated, for example, that the incidence can be dramatically reduced. I think by comparing counties that were participating in those, and those not participating, they observed through that program, the technology transfer program, that we are reducing the incidence substantially. The incidence in some counties has been reduced by 40%, which is phenomenal, really. But it also demonstrates that progress can be made through research and development and technology transfer.

Mr. WATKINS. I know we are field testing the first kill vaccine, and I understand there is a possibility it can be cloned. Also, there

is a possibility that ARS soon may contract with a pharmaceutical company to develop the vaccine.

Have we in fact entered a contract with the pharmaceutical companies?

Dr. KINNEY. I do not know. Perhaps Dr. Laster could answer that one.

Dr. LASTER. Well, we have surface antigens that are highly active and certain types of these antigens have been cloned. Those antigens that are being tested, in the laboratory if they have what appears to be a sufficiently high level of activity will then be field tested.

Mr. WATKINS. Do you plan to continue to move in that direction?

Dr. KINNEY. Oh, absolutely. We know, from other developments I mentioned earlier, such as the coccidiosis vaccine development in Beltsville. We know that if we can do it through this process, that it is very rapid. So there is no way that we will back off from it.

Mr. WATKINS. I know you are aware that I am following this quite closely, and with a great deal of interest. I hope you will continue in your efforts, because I am a believer that we can find an answer, and I think the answer is not too far down the road, either in a kill vaccine, or in a synthetic chemical. I may be optimistic, but I think with your commitment and your dedication to this I think we will get an answer.

SOUTH CENTRAL AGRICULTURAL RESEARCH CENTER

The South Central Agricultural Research Center, I have been watching quite closely and the research on vegetables and small fruits. I am indeed happy to see your budget reflects a small increase to further develop that program.

As a result of the research there is a new industry emerging for families in that area in vegetables and small fruits production. It has created a lot of excitement throughout that part of the country.

Do you plan to continue the ARS efforts until a full scale program is released so we can deal with a lot of these families?

Dr. KINNEY. We sure do. As you know, Mr. Congressman, perhaps you do not, we have two scientists on board there now, we are recruiting for a third, and we expect to have the facility completed by the end of this year, by December. And we will then be ready to fill that. We have a schedule for five scientists. We are looking for two more scientists at the present time.

Mr. WATKINS. As your priorities change in research are you able to redirect some funds to meet the demands? I do not want to get into the situation of finding funds transferred to the detriment of another program.

As you reach certain goals can changes be made to reflect the needs?

Dr. KINNEY. Yes. As a matter of fact, it would be refreshing to staff a facility that is being built, because it is a high priority need, and get it fully staffed in reasonable time. So, yes, with the support of the Congress, we would redirect the resources.

Mr. WATKINS. You have my cooperation there. And I hope if there are any problems in working with Oklahoma State Universi-

ty, your staff would let me know. We want to be fully cooperative in every way.

Dr. Bentley, will you be back with us when we have CSRS here tomorrow?

Dr. BENTLEY. Tomorrow, yes.

Mr. WATKINS. I will wait and ask a specific question I have concerning a transfer of funds, because that hearing is probably more appropriate.

COOPERATION WITH LAND-GRANT UNIVERSITIES

Do you have any direct working relationship with some of the Land Grant universities?

Dr. KINNEY. Yes, we do. It is a relatively small program in the ARS, but, yes, we have what we call a home economics group in Hyattsville, Maryland, which is part of ARS. So we cooperate with the home economics group.

Mr. WATKINS. I see.

NUTRITION RESEARCH

We had the nutrition people here before and I asked several questions about nutrition, and they kept referring to either ARS, or somewhere else where the research is being done. I am kind of concerned that they did not have much direct involvement. It appeared they were only taking the information gleaned from other sources. So they were relying on you pretty heavily.

I did not know if you were doing some things in those areas. I would hope that we could look at some increases along the way, if we possibly could.

Dr. KINNEY. Yes. Much of the development that FNS depends on is the responsibility of ARS.

IRRADIATION RESEARCH

Mr. WATKINS. Let me move on here. FDA has recently made some decisions on irradiation and utilization of the technology. I know you are conducting research in this area.

I know we have talked about it here in the Committee a great deal.

Dr. KINNEY. Mr. Congressman, we have been involved in irradiation research. Like much of the research that—much of the technology, or many of the decisions are based on research that ARS has done, such as quarantine, or levels of irradiation, food safety, so forth and so on.

Yes, we expect to continue, and to be very much involved.

NATIONAL ACADEMY OF SCIENCE REPORT

Mr. WATKINS. Let me ask you just one last question. I have a number of questions I would like to submit for the record. Last year I inquired about a National Academy of Science study involving some of their recommendations on animal diseases and future research.

What progress has been made in dealing with some of those recommendations? Will you bring me up to date, as to where you are in looking at some of that data?

Dr. KINNEY. The National Academy of Science's study made a number of recommendations. Some of these were misinterpreted by some of the research communities, that we were going to be transferring research to the mainland, and so forth and so on.

I would like to go on record as saying that we do not expect that some item is going to be replaced in the immediate future. But as we look at some of the biotechnology that is coming along, it is going to be entirely possible, down the road, that much of the research that we are doing, and treating as exotic, can in fact be done on the mainland, in somewhat the same way as the Center for Disease Control does their research on humans.

So we are watching that very closely. In fact, Jerry Callis, who is the Director of Plum Island, has recently stepped aside as Director, to assume the major responsibility of looking internationally at the potentials for solving some of the disease problems, and therefore helping us to predict what we are going to need in the future for resources, either at colleges, or new resources.

So we are still following up on the Academy study, and their recommendations, and making assessments of what resources are going to be needed.

BRUCELLOSIS

Mr. WATKINS. Brucellosis continues to be of utmost interest to the people of Oklahoma and especially the southeastern part of the state where the problem continues to persist. With the support of the Chairman and members of this committee, we have increased your funds in this area by about $2 million the past few years. I would like to see ARS continue to focus research toward developing an improved vaccine and improved diagnostic tests. I understand this work is going well. Do you plan to continue this effort?

Dr. KINNEY. Yes, we feel that we have made significant strides in development of improved vaccines and better diagnostic tests, but we must continue a major emphasis in this area if we are to see this work to completion.

Mr. WATKINS. Does ARS plan to continue the same level of support for the technology transfer program in Oklahoma, Texas, and Arkansas in fiscal year 1987?

Dr. KINNEY. We do plan to continue the same level of support in fiscal year 1987.

Mr. WATKINS. Could you provide for the record a progress report on materials distributed through this program?

Dr. KINNEY. Yes, 16 different brochures, 2 video tapes, and 3 slide sets have been developed. As of February 28, 1986, 266,148 copies of the brochures were distributed. The video tapes have been utilized by 54 groups, and the slide sets have gone out to 45 groups. The distribution of newsletters has included 10,268 copies of the Cattle Industry Newsletter and 3,764 copies of the Veterinary Newsletter.

Mr. WATKINS. In the primary area of distribution concentration for the technology center, can you draw a correlation between the

materials distributed to educate cattlemen and the drop in known infected herds?

Dr. KINNEY. Yes, there does appear to be a good, positive corhelation. It is our analysis that this program has been a very positive factor in reducing brucellosis in this area.

Mr. WATKINS. Does ARS plan to continue the field testing program at Hugo in fiscal year 1987?

Dr. KINNEY. Yes, ARS does plan to continue the field testing program at Hugo in fiscal year 1987.

SOUTH CENTRAL AGRICULTURAL RESEARCH CENTER AT LANE

Mr. WATKINS. From all indications, it appears that the program is going well at Lane. I know the contract has been awarded for construction of Phase II of the Center. When do you expect Phase II to be completed?

Dr. KINNEY. We expect Phase II to be completed before January 1, 1987.

Mr. WATKINS. How many scientists will be located in this additional phase?

Dr. KINNEY. There will be space for four additional scientists.

Mr. WATKINS. How many scientists are currently located on site?

Dr. KINNEY. There currently are three scientists on location.

Mr. WATKINS. How many are CSRS scientists and how many are ARS scientists?

Dr. KINNEY. There are two ARS scientists at Lane and one scientist from Oklahoma State University.

Mr. WATKINS. What is the proportion of ARS–CSRS scientists in the second phase?

Dr. KINNEY. There would be space for two addtional ARS scientists and two additional scientists from Oklahoma State University.

Mr. WATKINS. I was pleased to see that you are requesting an increase of about $300,000 for FY 1987. This would bring the funding up to a little over $700,000. This funding level would support about five ARS scientists. Is this correct?

Dr. KINNEY. With the increase we are requesting, the level of funding would support five scientists.

Mr. WATKINS. If this committee does not add funds this year or next year, can you redirect funds from other locations to Lane so we can keep this high priority program moving?

Dr. KINNEY. Yes, we can redirect resources to this new research location.

Mr. WATKINS. Can ARS have specific cooperative agreements with the Colleges of Home Economics as you do with the Agricultural Experiment Stations?

Dr. KINNEY. Yes, we can have cooperative agreements with the Colleges of Home Economics.

Mr. WATKINS. Could you allow scientists from the College of Home Economics, Oklahoma State University to be located at the ARS facilities in Lane. I think this is especially important in the product use and processing area. I will discuss funding for this with CSRS.

Dr. KINNEY. Yes, a scientist from the College of Home Economics, Oklahoma State University could be located at the ARS facility in Lane.

Mr. WATKINS. Do you foresee any problems with ARS cooperating with Red Ark in ARS research in the product use area? I know it is important for ARS to be involved in scale-up research in the integrated systems facility for processing. This will probably include cooling, irradiation and other means of light-processing of fruits and vegetables.

Dr. KINNEY. None whatsoever. We recognize this as an opportunity to cooperate with Red Ark on handling and marketing research of horticultural crops.

TICK RESEARCH AT POTEAU

Mr. WATKINS. I understand that the two small facilities you had planned for the Tick research at Poteau has been delayed. Do you plan to go ahead with these facilities this year?

Dr. KINNEY. No. However, we do plan some renovations to the small animal facility this year. Next year we will reassess our needs and the resources available at the location. It appears at this time that adequate office space is available from Kerr Foundation on a short-term basis.

EXOTIC DISEASES RESEARCH

Mr. WATKINS. Last year I inquired about the National Academy of Sciences' study that recommended a new facility for the mainland for foreign animal disease and ectoparasite research. I am most interested in brucellosis and other animal disease research. Is ARS planning construction of any new facilities on the mainland for this research?

Dr. KINNEY. ARS is not planning construction of any new facilities on the mainland for brucellosis or other animal disease research.

Mr. WATKINS. Would you please keep me apprised on a continuing basis of ARS plans in this area?

Dr. KINNEY. Yes, we will keep you apprised.

ARS RESEARCH PLAN

Mr. WATKINS. I would like to compliment you on the ARS Program Plan and the insight that was given in developing this paper for the future of agriculture research. What are the goals of ARS' six-year research plan?

Dr. KINNEY. The goals of the ARS six-year plan are to guide the implementation of ARS research programs consistent with the agency's mission, available resources, and the highest priority problems and research needs facing U.S. agriculture. The plan responds to the inputs of performers, users, and supporters of agricultural research and serves as a communication mechanism with these groups.

Mr. WATKINS. What will be your high priority programs on a national basis?

Dr. KINNEY. The highest research priorities of ARS on a national basis are to address problems of high farm production costs and loss of export markets. Important research approaches to these problems include improved quality and conservation of national resources, improved technologies for crop and animal protection and productivity, improved quality of agricultural commodities and products including human nutrition, and integrated agricultural systems.

COTTON RESEARCH

Mr. WATKINS. Dr. Kinney, could you submit for the record a list of recent research efforts and accomplishments on boll weevils, boll worms and other cotton insects?

Dr. KINNEY. The economical production of cotton requires protection from losses due to insect and mite pests. ARS research is to assure that safe and effective control measures are available on a continuing basis to prevent such serious losses. Research thrusts are directed towards the development of new or improved control practices that may be used alone or in integrated systems on single farms or on an areawide basis. Current control technologies under development include genetic methods, attractants, parasites and predators, microbial agents, plant growth regulators, insecticides, cultural practices, resistant varieties, and insect growth regulators. Additionally, research on quantitative survey methods and predictive models of insect populations are ongoing. ARS' goal is the integration of various control technologies into a total cotton production system. Research emphasis continues to be on important cotton insect pests including the boll weevil, bollworm, tobacco budworm, pink bollworm, spider mite, plant bugs, and others. Some selected recent accomplishments in cotton insects research are:

All cotton grown in Virginia, North Carolina, and South Carolina is included in the current Southeastern Boll Weevil Eradication Program. This program consisted of over 210,000 acres of cotton in the 3-State area when the eradication phase was completed in the fall of 1985. A 3-State post-eradication monitoring program and a buffer zone along the South Carolina/Georgia border will be maintained while Georgia, Florida and Alabama growers arrange for possible program expansion into their States. Cotton acreage in the initial trial area of this program conducted in Northeastern North Carolina and Southeastern Virginia increased from 12,483 acres in 1978 to 65,000 acres in 1984. Cotton insect control costs for this same area have declined by approximately $30.00 per acre. In 1985, all cotton grown in this 3-State program received an average of 40–50 percent fewer insecticide treatments compared to pre-program values. The boll weevil pheromone trap is an essential tool for detecting, and in some cases, eradicating low populations of boll weevils during both the eradication and post-eradication phases of the Southeastern Boll Weevil Eradication Program. This trap is used essentially in the same fashion in the Western Program and in the Texas High Plains Program, as well as by many State Extension Services.

Improvements in cultural control in stalk destruction methodology for prevention of overwintered boll weevils were accomplished

in the Lower Rio Grand Valley of Texas with the aid of aerial infra-red detection systems. Cotton was identified in field plots by aerial photography and shredded 1-2 week prior to plowing and populations of overwintered weevils were significantly lowered and resulted in decreased insecticide applications in the following Spring.

Harvest aid chemicals and defoliants applied to small test plots and large fields in Arizona and Southern California for control of the pink bollworm and boll weevil reduced populations of overwintering pink bollworm and boll weevils.

Population dynamics of Heliothis are being determined over time and space for the Central United States. Data is being gathered by a network of over 100 cooperators to indicate seasonal abundance and occurrence. This data will be valuable toward planning areawide management strategies and for validating models of occurrence and movement of these two species.

Studies on production of Heliothis in Northeastern Mexico and the Lower Rio Grand Valley of Texas revealed that corn planted on approximately 175,000 ha of irrigated land is heavily infested by the corn earworm. Soil sample surveys indicate that maturing corn in this region produces more than 7 billion adults in June. The potential economic effects of these insects on local cotton production as well as cotton production on the High Plains are tremendous.

Studies on beneficial arthropod predators in Southwestern desert cotton fields indicated that pink bollworm moths in early season oviposit on vegetative parts of cotton plants. During this period eggs and larvae are exposed to high risks from predation, as well as well as adverse environmental factors. Under laboratory conditions, several predator species consumed large numbers of pink bollworm eggs which indicated that predation may contribute to low early season infestations and thereby reduce early season applications of insecticides.

The tarnished plant bug is second only to the bollworm/budworm complex in insect economic importance in the Mississippi Delta. The results of field plots, greenhouses, and cage studies have indicated a reduction in plant bugs due to a nectariless trait in the cotton plant and additional studies from large fields of commercial cotton showed that the nectariless trait in cotton reduced plant bug populations resulting in a decrease in need for early insecticide applications.

Mr. WATKINS. Mr. Chairman, I yield.

Mr. TRAXLER. Mr. Myers of Indiana, and Purdue, and the other——

Mr. MYERS. Heartland of America. We do a lot of research. We are going to do some research on how to play basketball, too, I think.

[Laughter.]

Mr. MYERS. Have you got a special pill for that?

[Laughter.]

Mr. TRAXLER. Call Scott.

Mr. MYERS. You came down and stole him from us.

[Laughter.]

Dr. KINNEY. I spent four years at Purdue, so I have to ask the question, are you talking about IU or Purdue?

Mr. MYERS. They both fall in the same—put them both in the same hamper for this purpose. You would have a heck of a fight if you do, but you——

Mr. TRAXLER. John, at the risk of spoiling a Friday afternoon or Friday evening game, no one would have predicted that Michigan State would be carrying the banner for the Big Ten.

Mr. MYERS. No, really not. I have had three schools ahead of them, really. They would have been fourth on my list.

Mr. TRAXLER. Scott's done it all. Does he come from your district?

Mr. MYERS. No, just north of it.

[Laughter.]

Mr. MYERS. We did support him, hold him up.

RESEARCH ACCOMPLISHMENTS

Well, gentlemen, welcome to the Committee. It is always fascinating to have you people come before our Subcommittee here. Not only do we get excited to see what is in the goody package, but more particularly what your accomplishments have been during the past year.

Often in the Committee, especially the Appropriations Committee, when we must go back and justify the taxpayers' money we have spent, for research, it is much easier for us if we can point to some success as to how you have used the dollars that we have taken away from the public, many families out there suffering, trying to get enough money together to put shoes on their kids, and food in their stomachs, and send them to school to get an education.

And if you can show us how you spent the research dollars that we have provided, it makes it a lot easier, and we appreciate that.

LACTOSE INTOLERANCE

I for one, looking through the package here, I do not see the type of orchid that is, I take it is not edible, but everything else seems to be here. But one thing that struck my eyes, several years ago my wife sent me to the doctor, I had a problem, and it was one that I embarrassed her, and anybody else that was around. I did not know what was causing it, and the doctor did not, either, he said it must be something you are eating.

And I found out what it was, finally, just by trial and error, it was digestion, or lack of digestion, of dairy products. And the doctor did not know. Do the doctors know yet? For some reason I went to a doctor, a specialist, and he said, "Well, it has to be something you are eating."

And just by trial and error, according to here, 75 percent of the world's population suffers from this, and I notice it happens sometime during the first and second decade of one's life, and all of us are beyond that, and it did not happen during my first and second decade, it happened about the fourth or fifth decade, when I first noticed it, maybe everybody else noticed it before, I do not know. At least it was not noticeable to me, and people did not talk about it until I got——

Dr. KINNEY. Dr. Bentley's background is in nutrition, and he is a chemist by training, so——

Mr. MYERS. Who?

Dr. KINNEY. Dr. Bentley's background is in nutrition—animal nutrition.

Mr. MYERS. Yes, I know it.

Dr. KINNEY. And since we are animals, I expect he can respond to that.

Mrs. SMITH. Here is your orchid.

[Laughter.]

Mr. MYERS. My wife will love that on her dress tonight.

[Laughter.]

Dr. BENTLEY. Well, I think this is part of the development and research, it is very exciting, because we are looking not only at the ability to convert factors that are inherent in certain populations, that apparently they were not exposed to the use of dairy products, a high percentage of them, and we did not appreciate that until the Public Law 480 program began, and we began shipping dairy products into certain countries, Africa is a continent where they have not used milk, they do not have refrigeration, and all the other things that are necessary to people growing that——

Mr. MYERS. Hard to catch a tiger to milk, is it not?

[Laughter.]

Dr. BENTLEY. We found lots of people that had this problem. And I am not familiar with the changes in Africa, the second decade, or 25, 30 years old, but it is usually associated with the young.

But this is an example of a case, the relationship between specific nutrients in food, and our utilization of this in the area. Instead of running away from it, I think the thing to do is study it, and find out how to avert it.

You can treat milk, and it can be sold and utilized by populations that cannot handle the untreated or processed milk. That came out of some very basic research that was done about 25 years ago.

MOVING RESEARCH TO INDUSTRY

Mr. MYERS. Twenty-five years ago. Where has it been all this time?

Dr. BENTLEY. Well——

Mr. MYERS. Still researching, still in——

Dr. BENTLEY. No, finding out where to move it from the laboratory out into practice is not the easiest job. We find this all the time, that sometimes we underestimate the time and the cost it takes to take a research idea and turn it into a brand new product. That is what business finds.

Mr. MYERS. I notice here the product you produce here, you are taking the chicken out and putting an orchid in, and the poultry industry is out of every pot.

I notice that you say that people have a high incidence of intolerance includes about everybody, except you do not include North Americans, or the Scandinavians, or the Orientals or the—my wife is Scandinavian, and maybe that is the reason she makes fun of it

raising Cain with me. She does not seem to have the same problem I have.

Dr. KINNEY. Since it is a genetic trait, it would show up sporadically, like eye color, or anything else. But there are whole races of people that——

Mr. MYERS. Orientals must not have—you do not show Orientals there.

Dr. KINNEY. There are some Oriental populations that—sometimes it is confined to a country.

Mr. MYERS. Yes.

Dr. KINNEY. So that populations, by and large, cannot tolerate dairy products, unless they are processed.

Mr. MYERS. And the symptoms that you identify here are all the same. There is no other, that is the intolerance that they have, the symptoms that you show?

Dr. KINNEY. Yes.

Mr. MYERS. Well, we have LactAid tablets——

Dr. KINNEY. Who does?

Mr. MYERS. Where can I get LactAid tablets? I see you have got two of them here. I cannot wait——

Dr. KINNEY. Is Dr. Bill Thomas here?

Mr. MYERS. Can you get those in a drugstore now?

Dr. KINNEY. We will tell you exactly where to get them, Mr. Myers.

REDUCING LACTOSE IN MILK

Mr. MYERS. Okay. Well, you know, this is a great thing. I see you are treating milk, to reduce the lactose in milk, and is that going to be on the shelves one of these days, or are dairies going to go into this industry——

Dr. KINNEY. I think it is a matter of time before they are able to modify milk, cheese, or other dairy products, so that you will not have to worry about taking something.

I was talking to Dr. Carter about it this morning, and she is another chemist. You can see I am surrounded by chemists, they know all the answers.

Mr. MYERS. Except where you can get it.

[Laughter.]

Dr. KINNEY. They know the answers on paper, Mr. Myers.

Mr. MYERS. Well, I can do it on paper.

Dr. BENTLEY. Let me answer. I have never looked for it myself.

Mr. MYERS. I am going to be looking.

Dr. BENTLEY. All I know is that en route from the USSR and Helsinki, a little brochure that they had in the airplane, or the airport, told about, that taking this process, and trading some milk, and expanding markets for Finnish products in the African market, they are using this technique. I think it is available in certain stores right now. I do not know, for sure.

Dr. KINNEY. Oh, yes. Yes, it is.

Mr. MYERS. I do not mean to treat it lightly or facetiously, I am serious.

Dr. KINNEY. Well, I think it is available.

Mr. MYERS. Well, I have never seen an advertisement. I see ads in here by the AMA, and evidently the doctors I have gone to do not read their AMA materials, and maybe a few of them do, but this is just one of the things. I remember a few years ago you brought that super slurper, that came out of the Peoria Lab.

Dr. KINNEY. Yes, sir.

Mr. MYERS. And I called my friend out there, Bill Dillon who I knew ever since a little boy, and said, "Get me some of that, the river is flooded, and I need it." [Laughter.]

Mr. MYERS. And he thought I was—and so now this is another one.

Dr. KINNEY. There are a couple of tablets in there.

Mr. MYERS. Yes, I saw that. Will they work with mirrors?

[Laughter.]

Dr. KINNEY. No.

Mr. MYERS. They will not?

You got another one, another tablet for that?

Dr. BENTLEY. You have to have technology transfer for that.

Mr. MYERS One of your products in Michigan, you know, what if it works for this other foodstuff?

Well, I am serious about it. I guess you have to have—some levity here, or we would all go stark raving mad. Some people have already been there.

Dr. KINNEY. Right.

INCREASED USAGE FOR AGRICULTURAL PRODUCTS

Mr. MYERS. Well, you do great work, and if there is any area that we are going to cut, as far as I am concerned, in this Committee, we are going to have to cut through the appropriations of a great many to meet our requirements under legislation passed last December in the Congress, that most of us did not support, but we still have to live with it.

This is one of the areas that I think we can ill afford to reduce because, down the road, the only solution to agriculture is to find increased usage of our agriculture products. We cannot eat any more, or we should not eat any more. But we can find additional use for the products we do now have, and thereby, I hope, the American farmer can find a market for his products.

So I think you do hold the key there. There is a limit, of course, of how much you can wisely spend.

You are doing a good job, keep up the good work, because the American farmers certainly need the kind of support and help that you do give them.

Dr. BENTLEY. Thank you, Mr. Myers.

One thing that I would like to point out, that we are putting increased emphasis at my level into the idea of new uses and new products. We are looking at some of the things that are really trying to help move things that we have done work on, such as Kenaf, or fiber products that the ARS worked on for many years, and forgot about it, it is not being used, and there is a place for it, and we are trying to move into that area.

We are talking with the foreign people about possibilities about expanding efforts on corn starch. We know it is not an easy job, it

will take time, there is no panacea, there is no quick fix, but if we can start on it, we think we can find some place for it.

ARS LIAISON WITH FDA

Mr. MYERS. I think I have asked you this question before, but what working relationships do you have with FDA, because I can see a lot of necessity here to work together, do you have liaison between FDA, what you are doing, what they are doing?

Dr. KINNEY. Yes, we do. That is one of the things that my Deputy for National Programs established. He has a staff of about 40 experts, and Indians, and working in an area that are responsible for research that relates to food, food residues, or anything that the FDA does. They maintain close liaison with their top staff.

Mr. MYERS. Well, thank you for your testimony, and the fine work that you are doing.

Thank you, Mr. Chairman.

EFFECT OF GRAMM-RUDMAN REDUCTION

Mr. TRAXLER. Thank you, John.

Gentlemen, in conclusion, you had a $21.5 million reduction under Gramm-Rudman, and my recollection is the Committee asked you to spread that across all projects.

What has been the impact of that reduction? How has it affected research?

Dr. KINNEY. The principal impact, Mr. Chairman, has been that we have taken that, as the Congress instructed, by budget line item. So we have taken the cut at every location. And I guess this year we have been able to adjust to it, because we have used some funds from things like repair and maintenance, salary lapse funds and other funds, to accommodate for it.

But the principal impact of taking it across the board like that is we can do it for one year. If we had to continue the second year, then we would have to begin to shut down research, and obviously, Mr. Chairman, it is demoralizing to our best research groups, that are really working on high priority areas, doing the best research, to take a cut alongside of everyone else. So we are trying to accommodate to that.

Mr. TRAXLER. We were all pleased to note that in the Administration's budget you fared relatively well.

Dr. KINNEY. Yes.

IMPACT OF CSRS REDUCTION ON ARS

Mr. TRAXLER. And it raises some other questions, however, in relation to CSRS. They were not increased, and the question is, assume that they are going to face some difficulties in performing their responsibilities, if their budget figures changed. You work in very close partnership with them, of course.

Dr. KINNEY. Yes.

Mr. TRAXLER. Let us, for a moment, assume that their budget figure holds. What will that mean to you? Are you going to have to pick up some of the work that they are not going to be able to do, or what does it mean?

Dr. KINNEY. It will directly impact on many of our programs, and we would have to make adjustments to those. Let me give you one example.

Dr. Bentley and I met with some people from the Washington Wheat Commission this morning. And they pointed to the STEEP program, a program that has been going on for a number of years. It is offered between the universities, industry, extension and ARS. It is Solutions to Economic and Environmental Problems.

The soil out there, as you know, is a very sensitive soil. It requires very careful management. This program has allowed the wheat producers to grow wheat, and the pea and lentil people to grow their crops, without losing the land.

Now, currently the CSRS supports that program with its special grants. If that is not reinstated, then we will have to go back and work with the people and adjust to that. Because it is an important enough program, that someone will have to pick up the slack.

I just use that as one example of the sort of adjustments that are going to have to be made.

Mr. TRAXLER. That puts pressures on your budget, would it not?

Dr. KINNEY. Yes, it would. Insofar if we have a scientific staff located at the university, and the university gets a cut, then it could very well impact on the scientist that we have at Purdue, or Michigan, or California, or wherever.

Mr. TRAXLER. Does the Committee have any further questions of these gentlemen?

Mr. WATKINS. I have one.

Mr. TRAXLER. Mr. Watkins, I am going to have to leave in a couple of minutes. Would you come down and assume the chair, please?

Mr. WATKINS. I would be glad to do that.

Mr. TRAXLER. I thank my colleagues for their patience. I thank the witnesses for their presence here.

Dr. BENTLEY. Thank you.

Dr. KINNEY. Thank you, Mr. Chairman.

SIX-YEAR IMPLEMENTATION PLAN

Mr. WATKINS [presiding]. I will not take very much more time. I know ARS has a six-year research plan. Could you kindly update me on those goals?

Dr. KINNEY. Sure. Yes, we have released an update of that plan, that was initially issued about three years ago. We issued the update in November, and the Congress received a copy at that time.

It really adjusts, again, our thinking six years down the road, in terms of what our priorities are, the direction we see our programs heading. In terms of the ARS priorities, one of the misunderstandings, and I think it has been corrected in the minds of most of our cooperators and the industry groups, is the fact that some of them when they read our first program plan, thought that we were talking about priorities for everyone. But we really were not.

We were saying, of the things that are in the ARS mission, these are the priorities. So simply because we deemphasize something does not mean that we think it is not important.

ANIMAL HEALTH

Mr. WATKINS. Do you assume that animal health is one of the top priorities?

Dr. KINNEY. Yes.

Mr. WATKINS. Within that priority area, are you placing some emphasis on brucellosis, on looking at the farm animal health diseases or problems, exotic diseases, so to speak?

Dr. KINNEY. Yes, we are. Within that animal health area, the animal disease area, we are doing that by setting, again, priorities across all the disease entities. And things like brucellosis, and any exotic diseases, blue-tongue, or foot-and-mouth disease, or whatever, are going to remain high priority, until they are solved.

Mr. WATKINS. You can hardly prioritize all the things you have to do, but animal health diseases is maintaining a high visibility.

Dr. KINNEY. Absolutely.

Mr. WATKINS. Also in dollars.

Dr. KINNEY. Right.

Mr. WATKINS. The Chairmen are always concerned about that, and I would like to be able to go back to them with the fact that you are looking at not slackening your budgetary committee.

Dr. KINNEY. Right.

Mr. WATKINS. I know you hear from the National Cattlemens Association, and many of the others on efforts to solve some of these diseases. I know I hear from the Oklahoma cattlemen.

I wanted to highlight that a bit more, because I think that we have got some things that we can do, and we can cure, if we move in the right direction.

I really do not have any other specific questions, unless Mr. Myers and Mrs. Smith do.

Mrs. SMITH. I have nothing further.

Mr. WATKINS. Mr. Akaka was unable to be here today but he has several questions he would like answered for the record. We thank you for your appearance here today.

REGIONAL CENTERS FOR AQUACULTURE

Mr. AKAKA. Dr. Bentley, 7 U.S.C. 1475 (d) as amended by the 1985 Farm Bill provides authority for establishing regional centers for aquaculture research. What benefits would result from an expanded inititative in aquaculture research such as that authorized under the 1985 Farm Bill?

RESPONSE. The Department of Agriculture is presently funding several aquaculture research projects aimed at addressing the highest priority problems facing producers. The major benefit of a national system of aquaculture centers could be to address both long and short term industry needs to increase production capacity to offset foreign imports of fish and fish products.

Mr. AKAKA. Dr. Bentley, to what extent could a long-term aquaculture research initiative through regional centers for aquaculture improve efficiency and productivity in aquaculture?

RESPONSE. USDA has been involved in aquaculture research for many years through in-house research and through state cooperative institutions. This is an ongoing program and it is most difficult to ascertain if the establishment of the centers would vastly improve the present research program.

Mr. AKAKA. Dr. Bentley, what is the current U.S. trade deficit in fish products and in what way could this trade deficit problem be improved through a long-term initiative in aquaculture research?

RESPONSE. The U.S. food consumption of fish and fish products is supplied by importation of 82 percent of the total consumed. Food and industrial needs require approximately $7.5 billion in fish and fish byproducts to be imported. In the late

1970's, imported fish and fish products represented 28 percent of the non-petroleum deficit. Through greater emphasis on research and development of technology, the aquaculture industry in the United States should be able to significantly reduce the need for imported fish and fish products.

TRIFLY RESEARCH

Mr. AKAKA. Dr. Kinney, what is the status of the trifly research program initiated by Congress in FY 1986?

RESPONSE. ARS is developing improved eradication technologies in view of the successful eradication of the oriental fruit fly by Japan from all her islands except for those next to Taiwan, and the eradication of the Mediterranean fruit fly from Mexico except at the Guatemalan border. We are currently working on the same species developing methods to improve efficiency and reduce fly rearing costs. We are also developing new and/or improved eradication strategies. Specific examples include research on biological control, fruit fly ecology and behavior, attractant-bait, genetic engineering, and a large-scale eradication experiment on the Island of Rota for melon fly. In addition, preliminary Mediterranean fruit fly population studies are in progress on the Island of Kauai in preparation for a large scale eradication experiment. Discussions have been initiated with the University of Hawaii to develop a cooperative trifly research program.

Mr. AKAKA. Dr. Kinney, what are the goals of this research initiative?

RESPONSE. The goal of this research is to eliminate the Mediterranean and oriental fruit flies and the melon fly from Hawaii through development of new or improved trifly eradication strategies that will minimize impact on the environment while maintaining human health and safety.

Mr. AKAKA. Dr. Kinney, what are the potential benefits to Hawaii and other fruit fly infested areas from this research?

RESPONSE. The trifly species are quarantine pests, therefore, all host plants in Hawaii are quarantined. To export, host commodities must be treated with an approved method. Currently, because of treatment costs and requirements to allow only mature green fruits, papaya production has decreased in some areas. If trifly eradication is successful, the quarantine of host commodities will be removed, therefore, treatment for commodities like papaya will not be needed. Another significant benefit will be the develoment of alternative crops to sugarcane. Presently, there are no commercial plantings of most tropical fruits because they cannot be exported from Hawaii without treatment. If triflies are eradicated, Hawaii will be able to export all tropical fruit and vegetable hosts without quarantine treatment like lychee, sweetsop, soursop, star fruit, rambutan, mangosteen, guava, and cherimoya.

Mr. AKAKA. Dr. Kinney, what amounts are included in the budget for this program in FY 1986? In the FY 1987 request?

RESPONSE. For trifly research in FY 1986, the amount in the budget is $1,908,500, for 1987, the amount in the budget is $1,994,300.

QUARANTINE TREATMENTS RESEARCH

Mr. AKAKA. Dr. Kinney, what are the research goals of the quarantine treatments research?

RESPONSE. The first goal is to develop alternatives to ethylene dibromide, as well as to develop treatments that will open new export markets for our products that are currently quarantined. The second goal is to develop non-chemical alternatives for those commodities that now depend solely on fumigants. The ultimate goal is to develop and implement an eradication strategy that will eliminate need for quarantine treatment.

Mr. AKAKA. Dr. Kinney, what are the potential benefits to Hawaii and other fruit fly infested areas from this research?

RESPONSE. Hosts of quarantine pests cannot be exported into non-infested areas unless an approved treatment or certification system is available. If treatment/certification methods were available for all fruits and vegetables from Hawaii, Hawaiian agriculture could expand such production and divert some land from surplus sugarcane production. Other fruit fly infested areas would benefit because the new technologies developed would be applicable to fruits and vegetables exported from those areas.

Mr. AKAKA. Dr. Kinney, what amounts are included in the budget for this program in FY 1986? In the FY 1987 request?

RESPONSE. The amount included in the budget for FY 1986 is $4,338,700. For FY 1987, the amount is $5,433,700.

TASK FORCE ON ALTERNATIVE QUARANTINE TREATMENTS

Mr. AKAKA. Dr. Kinney, what contribution did ARS make to the Task Force Report on Alternative Quarantine Treatments?

RESPONSE. ARS's role in the Task Force Report on Alternative Quarantine Treatments was to coordinate and conduct the necessary research, and to provide the information that is reported in the document.

Mr. AKAKA. Dr. Kinney, under the heading of Basic Research Initiatives [part IV(b)(5)(b)], the task force report states "A field trial has been scheduled on an island in the South Pacific to determine the efficacy of a male annihilation treatment against the melon fly." What is the nature of this male annihilation technique?

RESPONSE. The male annihilation technique for the melon fly, which is planned for FY 1987 for the Island of Rota, involves the distribution of a bait composed of a male attractant, cuelure, mixed with a toxicant, such as naled. All fruit flies that contact the bait are killed. If sufficient males are killed in each generation, the population would eventually decline to zero.

Mr. AKAKA. Mr. Kinney, what is the nature of this field test and what potential application could this field test have for fruit fly infested areas of Hawaii?

RESPONSE. The test on Rota involves aerial spraying of cuelure at 2-3 week intervals and continual monitoring of the pest population to determine the effectiveness. The technique would be useful for Hawaii since it could be used in combination with sterile release. The use of sterile melon flies is more costly than the use of the male annihilation technique. Therefore, sterile releases could be limited to those areas of ecological concern like the habitat of the exotic *Drosophila* species and bait could be distributed on agricultural land. Another use of the male annihilation technique would be as a means to reduce pest populations before sterile release. The sterile insect technique is not very effective with high pest populations, but very effective with low pest populations.

Mr. AKAKA. Dr. Kinney, identify any research accomplishments in the past year which relate to efforts to control or eradicate 1) Medfly, 2) Melon fly, 3) Oriental fruit fly, 4) Malaysian fruit fly.

RESPONSE. Significant progress has been made in genertic engineering for developing male—only strains of Medfly for use in sterile release programs. Techniques have been perfected to transfer desired DNA factors from *Drosophila* into Medfly embryo. Laboratory demographic life tables for 4 species of fruit flies have been completed. A pilot test is underway on the Island of Rota, to determine if the melon fly can be eradicated by the male annihilation technique with extremely low dosages of a toxicant in the bait mixture. A rearing technique has been developed for the Malaysian fruit fly to produce sufficient flies for small scale laboratory tests. The technique will be refined to produce larger numbers needed for more tests planned.

Mr. AKAKA. Dr. Kinney, what research on these species will be undertaken in FY 1987? Identify amounts by location.

RESPONSE. In FY 1987, we will continue to develop new or improved attractants and baits, ecological and behavioral information, genetic engineering for the sterile insect technology, and biologhical control for the trifly species. In addition, the eradication test utilizing the male annihilation technique for the melon fly on Rota will continue. Also, a large scale Mediterranean fruit fly population/ecology study, and quality improvement of sterile flies in preparation for a large scale eradication experiment on Kauai will be undertaken. For the Malaysian fruit fly, laboratory rearing will be perfected to repoduce the needed numbers to develop attractants, sterile radiation dosage levels, and a quarantine treatment for peppers. The level of funding for this research totals $1,908,500 for the Hawaii location.

Mr. AKAKA. Dr. Kinney, identify any research accomplishments in the past year on alternative quarantine treatments for Hawaiian crops. Idenitfy amounts by location.

RESPONSE. In the past year we completed research as follows:

Sharwill avocado.—If stems are attached, sharwill avocados are not hosts for fruit flies in Hawaii.

Papaya.—The incidence of hard spot, a condition in which lumps form as the frusit ripens due to uneven ripening, was significantly reduced by changes in the double dip procedures. These changes have improved the quality of exported papayas.

Lychee.—Laboratory tests have showed that lychees can be cold treated for oriental fruit flies without adverse effects on the fruit quality. These tests will continue.

Tropical fruits and vegetables.—Research on the fly-free concept has been initiated. This concept is a means by which host fruits and vegetables which are susceptible to infestation by quarantine pests are produced free of infestation within an area that is rendered and certified pest free. Two areas, one on Hawaii and one on Kauai, have been selected for the experiment. These long term research, if successful, will eliminate need for quarantine treatments for host fruits and vegetables of the trifly.

The amount for Hawaii in FY 1986 for commodity treatment is $1,182,200.

Mr. AKAKA. Dr. Kinney, what research will be undertaken in FY 1987 on alternative quarantine treatments? Identify amounts by locations.

RESPONSE. The following research will be undertaken. The hot water immersion methods for the Caribbean, Mexican, and West Indian fruit flies in 5 varieties of mangoes will be developed. The double dip for the trifly in Hawaii in papayas to allow riper fruits will be refined. Radiation studies will be conducted for the Mexican and Caribbean fruit flies in grapefruits and mangoes, for the codling moth in walnuts, apples, and cherries, and for the cherry fruit fly in cherries. Cold treatment for the trifly in lychee will continue. Methyl bromide treatment for all fruit flies in the U.S. in peaches, plums, and nectarines will continue. The methyl bromide schedule for the Mexican Caribbean fruit flies in citrus, and for codling moth in apples will be refined. Development of the fly-free concept for the Caribbean fruit fly in citrus will continue. The fly-free concept for the trifly in subtropical fruits will be initiated. The research on the non-host status of avocado for the trifly will be completed. Development of the sound detection device for fruit flies in citrus, mango, and papaya, and codling moths in apples will continue.

The amounts and locations for FY 1987 are as follows:

Fresno, CA	$871,000
Gainesville, FL	64,600
Miami, FL	1,108,800
Orlando, FL	114,100
Hilo, HI	1,535,300
Weslaco, TX	1,084,300
Yakima, WA	655,600
Total	5,433,700

Mr. AKAKA. Dr. Kinney, what is the status of construction and start-up of operations at the Hawaii Germplasm Repository?

RESPONSE. The National Clonal Germplasm Repository located at Waiakea, HI, is to begin operation in June 1986. The curator has been hired and the construction is almost complete. The activity is on schedule.

Mr. AKAKA. Dr. Kinney, what will be the special focus of the Hawaii facility and what are the benefits associated with establishing a germplasm repository to focus on these species?

RESPONSE. The National Clonal Germplasm Repository in Hawaii will focus upon the collection, maintenance, evaluation, and enhancement of species of macadamia, papaya, passion fruit, guava, and pineapple. None are native to the United States so this collection will be the sole reservoir of these genetic materials available for nurserymen and researchers who are developing superior varieties from wild or cultivated plants. It is the only repository handling tropical crops of the Pacific Basin of importance to U.S. agriculture.

Mr. AKAKA. Dr. Kinney, once the Hawaii facility becomes operational, what will be the annual cost to staff, equip, and operate the facility? What amounts are included in the FY 1987 budget to satisfy these needs?

RESPONSE. We have identified $135,000 for the annual operational budget. In FY 1987, $150,000 will be allocated as some additional start-up costs will be incurred.

RESEARCH TO ELIMINATE EXPORT BARRIERS

Mr. AKAKA. Dr. Kinney, your budget request for FY 1987 contains a proposed increase of $3,000,000 to reduce losses and remove barriers to commodity exports. One focus of this research will be the development of technologies to establish pest free zones for quarantine treatments.

What is the pest free zone concept and what benefits would result from estalishing pest free zones.

RESPONSE. The pest free zone concept is a means by which host fruits which are susceptible to pest infestation such as fruit flies in citrus are produced within an area that is rendered and certified free of the pests. As long as no fruits are infest-

ed, they could enter into interstate commerce without quarantine treatment. In Hawaii, one or more of the trifly species are present throughout the year. We, therefore, plan to rid the trifly from a given area and with current technology install a barrier to maintain a pest-free status for fruits within the zone.

Mr. AKAKA. Dr. Kinney, of the proposed increase, what amounts will be expended on pest free technologies and what species will be the focus of this research? Identify amounts by location.

RESPONSE. Within the proposed FY 1987 increase of $3 million, $300,000 will be spent on Kauai, Hawaii. The species are the Mediterranean and oriental fruit flies, and the melon fly. The $3 million increase by location follows:

Location:	*1987 Increase*
Miami, FL	$300,000
Athens, GA	500,000
Dawson, GA	300,000
Savannah, GA	250,000
Kauai, HI	300,000
Manhattan, KS	500,000
Clay Center, NE	250,000
Wyndmoor, PA	300,000
Weslaco, TX	300,000
Total	3,000,000

Mr. AKAKA. Dr. Kinney, evaluate the feasibility of establishing fruit fly free zones in Hawaii and identify the benefits of establishing such pest free zones including any potential savings from reduced quarantine treatment costs.

RESPONSE. The probability of success for a fly-free zone for Hawaii is high provided flies are eliminated from an area, and a biological or chemical barrier can be maintained. Fruits within the barrier will not have to be treated. In the case of papayas, the benefits would include savings from the double dip procedure and labor savings for harvesting from 2 times to once per week. An additional benefit is that expanded fruit production in Hawaii provides an alternative to sugar cane. The possibility of production and export of these alternative fruits and vegetables would be enhanced.

Mr. AKAKA. Dr. Kinney, another focus of your proposed budget increase on eliminating export barriers will be on the use of radiation as an alternative to fumigants. What research will be undertaken by ARS on radiation as an alternative to fumigants either through this proposed and location.

RESPONSE. We will continue our research program to develop radiation as a quarantine treatment method for the Caribbean and Mexican fruit flies in mangoes, grapefruits, oranges, and tangerines; for the codling moth in applies; and for the cherry fruit fly in cherries. The amounts by activity and location are as follows:

	Location	FY 1987
Citrus and mangoes:		
Caribbean fruit fly	Miami, FL	$222,000
Mexican fruit fly	Weslaco, TX	149,500
Apples and cherries:		
Codling moth and cherry fruit fly	Yakima, WA	163,900

LETHAL MOSQUITO GENES

Mr. AKAKA. Dr. Kinney, among the selected examples of recent ARS accomplishments is the development of techniques for introducing lethal genes into mosquito populations. Has this technique been successfully tested in the laboratory or in the field, and if so, what have been the results of this testing?

RESPONSE. Limited, but successful, field trials with mosquitoes have utilized chromosomal aberrations, but no field tests have been attempted with recessive lethals. In the laboratory, we have developed lethal strains that breed true with about 50% lethality each generation. Laboratory evaluations have yielded results consistent with theoretical expectations.

Mr. AKAKA. Dr. Kinney, what is the nature of this research and what are its potential applications?

RESPONSE. The primary objective of this research is to develop new control technologies for mosquitoes and other pests of medical and veterinary importance through the exploitation of genetics, cytogenetics, and molecular biology of selected pest species. Classical breeding schemes and molecular approaches (recombinant DNA techniques) have been integrated in a program to create novel control strategies based on the most modern genetic techniques available. The ultimate intention is to use genetic mechanisms to supplement or replace coventional control methods based on pesticides.

Mr. AKAKA. To what extent do you anticipate that a species instinct to survive or the natural process of species evolution would enable a species into which lethal genes had been introduced to overcome an eradication attempt?

RESPONSE. Although this question has been anticipated by the scientists involved in the development of genetic control methodologies, there is no absolute answer at this point. However, there is proof from the successful use of the sterile male technique for the eradication of the screwworm fly and the suppression of the Mediterranean fruit fly that genetic control without the development of natural "resistence" is feasible. Nevertheless, ARS is continuing to consider this issue and seek scientific answers.

ARS STAFF AT HAWAII FACILITIES

Mr. AKAKA. Dr. Kinney, what is the nature and extent of the presence of ARS staff at the Oceanic Institute?

RESPONSE. ARS has one scientist who has been on detail for almost a year from the Southern Regional Research Center. His expertise includes the areas of waste utilization, a major component of the project in Honolulu. We are currently recruiting for two research associates, one which is to be stationed at the Oceanic Institute and the other will be located at the Western Regional Research Center, but will be working in complementing the Oceanic Institute program in growth and production of algae, one of the feed sources being developed. A fourth scientist is under consideration for assignment to add an animal health component to the current project.

Mr. AKAKA. Dr. Kinney, what are the benefits that accrue to ARS from this staff arrangement?

RESPONSE. ARS is building personnel with additional disciplinary expertise in various phases of aquaculture production and feeds development. The broad program at the Oceanic Institute, their expertise, and the opportunity for additional training at the University of Hawaii in related areas offer a unique research and training experience.

Mr. AKAKA. Dr. Kinney, to what extent have you considered expanding the ARS presence at the Oceanic Institute?

RESPONSE. We have no current plans to expand ARS presence of on-site personnel beyond that already described. We do plan a review of the Oceanic Institute program this fiscal year which should bring us even closer to the missions and accomplishments and opportunities at the Institute.

COMPREHENSIVE FEEDS PRODUCTION PROGRAM

Mr. AKAKA. Dr. Kinney, what are the research goals of the Comprehensive Feeds Production Program in Hawaii?

Response. The research program at the Oceanic Institute is designed to develop technology and information which can be used to improve the economics of production of livestock and aquaculture species while utilizing and developing alternative uses for agricultural wastes. This program should lead to the development of methodology for cost-effective, commercial-scale production of alternative feed ingredients for livestock and aquacultural industries in tropical and sub-tropical environments, while identifying and documenting economically viable alternative uses of agricultural wastes.

Mr. AKAKA. Dr. Kinney, what are the potential benefits to Hawaii from this research?

RESPONSE. This effort should result in reduced costs of feed for animal production, including aquaculture, which should enhance the further development of agricultural industries that are sensitive to the above factors of production.

Mr. AKAKA. Dr. Kinney, what amounts are included in the budget for this program in FY 1986? In the FY 1987 request?

RESPONSE. The $700,000 budget to support the program in Honolulu has been subject to the Gramm-Rudman-Hollings law as have all other programs in ARS. The available monies in FY 1986 are $665,900. Funds estimated for FY 1987 are $695,800.

RESEARCH ON CROPS STRATEGIC VALUE

Mr. AKAKA. Dr. Kinney, to what extent is ARS engaged in research or demonstration on any of the following crops which may be of strategic value (Identify the nature of the research by crop, and state the amount expended or planned to be expended for each crop by fiscal year):

I. Long chain fatty acid crops—used for the production of lubricants, plasticizers, slip agents and foam suppressants.

(a) Crambe spp. (Cruciferae—mustard and family); (b) Meadow Foam (Limnanthes spp.) native to northern California; (c) Honesty—Lunaria annua L. (Cruciferae—mustard family); (d) Rapeseed—Brassica spp. (Cruciferae—mustard family).

II. Medium chain fatty acid crops—used for soap and detergent manufacturing.

(a) Cuphea spp. (Lythraceae)—of South American origin and also found in Mexico and southern U.S.

III. Hydroxy fatty acid crops—caster oil products.

(a) Lesquerella spp.—found in south central U.S. and northern Mexico in dry areas.

IV. Epoxy fatty acid crops—used for coatings and adhesives. Currently manufactured from petrochemicals, linseed and soybean oil.

(a) Ironweed—Veronia spp. (Compositae—daisy family); (b) Stokes aster—Stokesia spp. (Compositae—daisy family).

V. Liquid wax esters—used for high performance lubricants, cosmetics and other finished products.

(a) Jojoba—Simmondsia Chinesis—grown in dryland areas.

VI. Vegetable oils for energy crops.

(a) Chinese tallow tree—Sapium sebiferum (Euphorbiaceae) Used commercially in Asia for the drying properties like linseed oil.

Response. ARS is engaged in research on crambe, rapeseed, cuphea, and lesquerella. The nature of the research and the amounts expended or planned by fiscal year follows:

Crop	Nature of research	Funding		
		FY 1985	FY 1986 Estimated	FY 1987 Planned
Crambe	Breeding and production	$2,700	$2,600	$2,700
Rapeseed	Breeding and production	85,100	72,300	72,300
Cuphea	Breeding and production	362,000	401,900	420,000
Lesquerella	Breeding and production	20,000	19,000	19,900

CROPS FOR CRITICAL INDUSTRIAL MATERIALS

Mr. AKAKA. Dr. Kinney, to what extent is ARS engaged in research or demonstration on any other crops which may be of strategic value (Identify the nature of the research by crop, and state that amount expended or planned expenditures by fiscal year).

RESPONSE. ARS has a research program on guayule as a source of natural rubber. The program is closely coordinated with other guayule research conducted by Arizona, California, New Mexico and Texas that is supported by CSRS and State funds. As ARS research on guayule water requirements, salt tolerance and envionmental effects on rubber production is completed, more emphasis will be placed on guayule genetics and germplasm enhancement to increase the rubber content in the plant and production per acre. The research also involves environmental effects on rubber quality in the plant and in the shrub during harvesting, bioregulation, processing and non-irrigated production systems. The budgets for 1986 and 1987 are $1,170,000 and $1,223,000, respectively.

RATOON STUNTING IN SUGARCANE

Mr. AKAKA. Dr. Kinney, among the selected examples of recent ARS accomplishments is identification of a form of bacterium which is responsible for ratoon stunting in sugarcane. What are the benefits associated with this discovery?

RESPONSE. Control strategies for any disease are more effective when one knows what the causal pathogen is. In this instance, a primary benefit is that breeding and enhancement programs will be expedited. Having identified the pathogen, we were able to produce an antiserum which is now used to detect the pathogen in plant tissues. This is especially important when the pathogen is latent and when it is responsible for causing stunting which can not be easily distinguished from stunting due to other causes. With this former limitation, it was difficult for breeders to know which of their lines were resistant or susceptible because rate of growth was not always directly correlated with the presence of the pathogen. Another benefit to rapid and reliable detection of latent bacteria is that it expedites processing germplasm through quarantine in international exchange of seed stocks.

Mr. AKAKA. Dr. Kinney, where was this research carried out?

RESPONSE. This research was performed cooperatively by ARS and State scientists at Beltsville, Maryland, and Fort Lauderdale, Florida, respectively.

STORAGE OF SUGARCANE POLLEN

Mr. AKAKA. Dr. Kinney, among the selected examples of recent ARS accomplishments is the development of new storage techniques for sugarcane pollen. What are the benefits associated with this discovery and what potential benefits does this discovery hold for other crops?

RESPONSE. This research finding will make it easier to make hybridizations between sugarcane germplasm lines and between commercial types and sugarcane relatives. Cross-pollination is now difficult because sugarcane pollen lasts only a few days and it is difficult to synchronize flowering of sugarcane species. This technique of freezing pollen to minus 80 degrees C. is useful in many other crops as well, as it will facilitate storage and exchange of pollen used in public and commercial plant breeding programs.

Mr. AKAKA. Dr. Kinney, where was this research carried out?

RESPONSE. This research was conducted at Canal Point, Florida.

SUGARCANE RESEARCH

Mr. AKAKA. Dr. Kinney, in a unified table, provide a breakdown by state of ARS sugarcane research for FY 1985, FY 1986, and amounts proposed for FY 1987 and the percentage of sugarcane produced by each state receiving sugarcane research funding.

RESPONSE. The following table provides the information requested.

State	ARS funding of sugarcane			Percent of sugarcane production
	FY 85	FY86	FY 87	
Louisiana	$1,641,900	$1,561,900	$1,632,100	23
Florida	1,142,100	1,086,400	1,135,300	40
Hawaii [1]	610,600	580,800	606,900	33

State	ARS funding of sugarcane			Percent of sugarcane production
	FY 85	FY86	FY 87	
Maryland	225,300	214,300	223,900	0
Texas	222,300	211,500	221,000	4
Mississippi	106,100	101,000	105,500	0
Oregon	24,500	23,300	24,300	0
Total	3,972,800	3,779,200	3,949,000	100

[1] ARS program funds are administered from California but research is conducted in Hawaii.

Mr. WHITTEN. Dr. Kinney, our good friend, Congressman Steny Hoyer, a Member of the Committee on Appropriations, has asked that the following questions be answered for the record:

Mr. HOYER. Dr. Kinney, when you appeared before this Committee in 1984 and again in 1985, you stated that you planned to re-establish the Beltsville Agricultural Research Center to the prominence that it held before the 1972 reorganization of the Agricultural Research Service. Planning efforts were then undertaken. Last year, the Committee directed that Congress be kept fully advised as the Department works to restore and upgrade BARC. What progress has been made in achieving this goal?

RESPONSE. We have taken the following actions to upgrade and restore the Beltsville Agricultural Research Center to its former prominence:

1. The influence and visibility of the Center has been substantially enhanced by concentrating at the Center the leadership of ARS national research programs and virtually all ARS administrative management functions. The operation of ARS, in accordance with one strategic program plan, has been reestablished. This was achieved by greatly strengthening the role of the National Program Staff in setting priorities and in allocating resources in accordance with priorities. All National Program Staff positions have been returned to Beltsville. Also, the Administrative Management Services personnel have been relocated from Peoria, Oakland, and New Orleans, to Beltsville.

2. Since 1984, $4.2 million additional recurring appropriations have been allocated to Beltsville for new and expanded high priority research efforts. Additionally, several million dollars have been allocated on a one-time basis for facility upgrading in the past 3 years.

3. In 1985, a plan, Renaissance 93, was developed for restoring and upgrading Agricultural Research Service programs, facilities, and equipment at Beltsville. The most urgent items in the plan pertain to Center-wide improvements in physical facilities (e.g., restoring water lines, roof repairs, steamline repairs, resurfacing of roads, construction of fire escapes, etc.). The second most urgent need is to acquire state-of-the-art research equipment and instrumentation. Also, the plan lists various needs in relation to repair and maintenance and energy retrofit of laboratories, and some new construction.

4. Programs in plant genetics and germplasm were strengthened by establishing the Plant Molecular Genetics Laboratory, the Germplasm Introduction and Evaluation Laboratory and the Germplasm Quality and Enhancement Laboratory.

5. Virtually all taxonomic research on plants, pests, and beneficial organisms was placed into the newly created Biosystematics and Beneficial Insects Institute. This action will enable ARS to better meet the needs of action agencies and to more uniformly improve the quality and productivity of taxonomic research.

6. Research was greatly strengthened in hydrology, remote sensing, and modeling and database management by creating the Agricultural Systems Research Institute. This action will enable ARS to better meet the needs of SCS and other action agencies.

7. Research in agricultural engineering was revitalized by establishing the Sensors and Control Systems Institute. This action will lead to efficiencies in marketing and production through the application of sensing and control principles.

8. A modern small animals research facility was constructed to facilitate research on parasitic diseases of poultry and livestock. A gene transfer facility is being constructed to facilitate livestock improvement through genetic engineering. Steamlines for heating a portion of the greenhouse complex have been upgraded. Funds have been committed to replace the roof of the BioScience building and to totally renovate a building for research on plant molecular genetics.

9. Two areas of human nutrition research were strengthened substantially. The first area, obesity and energy metabolism, was strengthened by constructing the only human calorimetry facility in North America. An internationally renowned expert was placed in charge of this research. The second area, effects of sugar and copper consumption patterns on heart disease, was strengthened by forming a team of animal scientists and human nutritionists. This team has developed the use of swine as an excellent model to investigate the dangerous effects of copper deficiency and the exacerbation of these effects by certain sugars such as fructose.

Mr. HOYER. It is my understanding that you have completed, or are near completing, a comprehensive plan for restoring and upgrading the Beltsville Center. Could you please describe your efforts in this regard and tell us when we might expect to receive a final copy of such a plan?

RESPONSE. As you know, the first major phase in developing a plan to restore and upgrade the Center has been completed. On October 1, 1985, we released a document, "Renaissance 93" that identified the major research thrusts to solve significant problems in agriculture and human nutrition and the corresponding facility and equipment needs. This document was made available to the Congress, to the Secretary of Agriculture, and to the Office of Management and Budget.

The second phase will be the development of a comprehensive financial plan to accomplish the restoration and upgrading of the Center. Because of the uncertainties concerning adjustments that will have to be made in relation to reducing the Federal deficit, we require at least 1 year to develop a comprehensive financial plan.

Mr. HOYER. Could you give us an idea as to what an adequate downpayment would be for such a "Renaissance" project in FY 87?

RESPONSE. It is imperative that we halt further deterioration of buildings, roads, steamlines, waterlines, and other aspects of the physical plant. Secondly, we need to develop plans for an ultra-clean small animal facility. This facility is needed to identify trace elements that are essential in human nutrition and to determine their roles. The mounting public concern about the quality of care of animals used in research adds urgency to this need. Thirdly, we urgently need to acquire some state-of-the-art scientific equipment. In the event that our budget does not sustain further reductions, then we plan to allocate $5–6 million to meet these needs. We recognize that an additional $2 million to $4 million in FY 1987 would make a decisive difference in meeting the most urgent needs.

Mr. HOYER. Keeping in mind that this year's budget deficit crisis will make funding for new initiatives unlikely, what would you say would be a priority amount that would be necessary to avoid costly deterioration and guarantee BARC's important research contributions to the agricultural industry?

RESPONSE. The highest priorities are to assure the viability of the Center's physical plant, plan for a small animal facility that will meet the mounting public concerns about the quality of care of research animals, and acquire some state-of-the-art scientific instruments. In order to make significant progress in restoring and upgrading the Center in FY 1987, approximately $8–10 million should be allocated to the above needs. We may be able to meet $5–6 million of this need from base funds.

Mr. HOYER. As you are aware, there has been some questions raised as to the adequacy of the small grains research and storage facility at Beltsville. In 1985, you described in detail some of the accomplishments of this facility. Do you foresee the need for changes or improvements in this facility, or is it adequate to handle needs for the foreseeable future, without additional expense?

RESPONSE. About 18 months ago, the National Small Grains Collection was provided with an additional new cold storage facility that increased the overall storage capacity by 30 percent. This additional storage will give us expansion space for at least another 10 years. In addition, during the past 4 years we have been systematically evaluating the wheat, barley, and oat accessions. Hereby, we are identifying duplicate accessions that might better be stored in a base collection rather than occupying valuable space in this active working collection. If necessary, the capacity of the collection could be further increased by no less than 25 percent by mounting the shelving on tracks, so that space currently used as aisles would be occupied by additional shelving. Thus, we are fully confident that the facility is adequate to meet our needs until at least 2005 A.D.

BIOGRAPHY OF THOMAS J. CLARK, ACTING DEPUTY ADMINISTRATOR FOR ADMINISTRATIVE MANAGEMENT, AGRICULTURAL RESEARCH SERVICE

Tim Clark, as he is known in ARS, began working for the Bureau of Animal Industry, USDA, in Washington, DC, in September 1952. Since 1952 he has worked in a variety of positions in ARS, including Administrative Officer for Soil and Water

Conservation, Meat Inspection, and the Animal Science Divisions. From 1972 to 1979, Mr. Clark was the Regional Administrative Officer, Northeastern Region and in 1979 became the Director of the Administrative Operations Division. In 1983 Mr. Clark became the Associate Deputy Administrator for Administrative Management, ARS.

He was born on March 30, 1933, in Westernport, Maryland, and grew up in the small coal mining town of Barton, Maryland, in Western Maryland.

From 1954 to 1956 Mr. Clark served as an NCO with the U.S. Army. He received his Bachelor Degree in Business Administration and Bachelor of Commercial Science Degree from Southeastern University, Washington, DC, in 1959.

Mr. Clark has devoted 27 years of his 34 years of Federal service to the support of ARS research programs.

Statement of Dr. Orville G. Bentley, Assistant Secretary
for Science and Education, before the House Subcommittee on Agriculture,
Rural Development and Related Agencies

Mr. Chairman and members of the Committee, I am pleased to have this opportunity to present to you the 1987 request for our science and education agencies. Given limits on overall funding levels to meet deficit reduction targets, we have made a number of very difficult decisions in compiling our budget plans. Overall, the science and education budget totals $913 million, down from the 1986 estimate of $1.1 billion. Much of this decrease results from elimination of special grants and reductions in extension funding. Many of the reductions are proposed on the same basis as in prior years -- that earmarked programs can be funded from other sources if accorded a high priority by the States. Instead, our request emphasizes support for basic scientific research crucial to future developmental advances and research and extension to bolster farm profitability. I would like to provide a brief overview of our proposals and ask the agency administrators to discuss in detail their particular activities.

As we proceed to formulate the 1987 programs and budgets for our research and education programs, American farmers are in the midst of very difficult economic conditions. World agricultural surpluses continue to depress prices and export levels. It is still too early to determine what effect the declining value of the dollar will have on competitiveness of U.S. farm products in world markets. Farmers and lawmakers alike will be analyzing the implications of the 1985 Farm Bill on our farm economy. Budget reduction actions under Gramm-Rudman pose yet another unknown. Clearly, however, the farm economy will be a major beneficiary of lower Federal budget deficits.

One of the most frustrating aspects facing farmers is that, despite good growing conditions, availability of high quality inputs and constant hard work, producers find it increasingly difficult to operate on a profitable basis. Tempered by the need to reduce Federal deficits, our 1987 proposals would continue and expand efforts to address farm profitability. I would like to briefly highlight these priorities for the Committee.

Current and projected surpluses continue to depress farm commodity prices. Our 1987 request for ARS proposes a renewed effort to find new markets and uses for these surplus commodities. As with most of the other complex problems we face, a single, simple solution does not appear likely. Therefore, the ARS research will explore a variety of avenues to develop new outlets for corn, wheat, soybeans and cotton. We have already consulted with industry and will continue to encourage this cooperation to emphasize those projects with the greatest potential for market success. Other projects in this initiative will focus on new uses for dairy products, new technologies to enhance export opportunities and new fresh fruit and vegetable products. The results of this research could provide an entry for agricultural commodities in the production of feedstock and specialty chemicals, new packaging and bonding materials and new food products to serve overseas markets and replace imports.

Dr. Kinney will provide more details on this important initiative. Mr. Chairman, I urge the Committee to give this proposal the high priority it deserves. Given advancements in basic sciences and biotechnologies, I truly believe we have an opportunity to make some significant developments to assist American farmers in regaining profitability and export competitiveness.

To assure continued crop improvements in the longer term, ARS is proposing a $3.5 million increase in plant germplasm research. With increased pressures to produce with fewer inputs -- less water, fertilizer and chemicals -- it is essential that plant breeders have available a diversity of genetic material to impart disease resistance, drought tolerance and other characteristics into crop plants. Advances in genetic transfer and other biotechnologies will make this genetic diversity more immediately usable.

We are also exploring opportunities to develop new crops for American farmers, continuing an effort set in motion by a 1984 Secretary's Challenge Forum. A task force of university, industry and government experts is identifying opportunities for new crops which could provide American farmers with a new source of income.

Our budget in support of university research reflects the continuation of an important trend begun in 1985 with the increased funding for competitive research grants. Each of our program announcements has been met with an overwhelming response of excellent proposals. In fact, in 1985 we were able to award only one grant for every five proposals. These grants were awarded to a range of university, nonprofit, state and Federal researchers -- many who would not be eligible under other USDA programs. We are excited about the interest expressed by the research community in working on the basic agriculture topics addressed in this program. We look to the Committee for continued support of this important program.

The budget includes some significant reductions in Extension funding, as you know. First, we are again proposing to eliminate funding for the earmarked programs. Prior funding in these areas has provided for development of programs which can be continued with formula funds or State and local funds. Also proposed is a 50 percent reduction in the general formula programs. Under the proposed funding level, we will continue to provide assistance to States in identifying priorities, adapting research results and coordinating efforts among local extension services. While these are large reductions, we are confident that the extension system will survive with the support of state and local governments.

Formula distributions provide the greatest flexibility in addressing priorities at the local level. Assistance to farmers in financial stress, support for programs under the 1985 Farm Bill and conservation of natural resources will be given high priority in 1987. Extension has been a major factor in assisting farm families with financial concerns -- 100,000 families have received assistance in the past two years. Estimates indicate that more than twice this number need this type of assistance.

New conservation programs authorized in the 1985 Farm Bill provide farm operators with a more complex set of decisions that will influence their ability to operate profitably. In the case of the conservation reserve program, farmers could enter into long-term land retirement contracts. The long-term nature of this program presents a new dimension in the decision process. Extension has already provided information to the States and will continue to coordinate the development of decisionmaking programs to help farmers identify the most

advantageous level of participation. Extension will also be assisting with the implementation of the dairy herd buyout program and other changes in the farm legislation.

Although much smaller in terms of budget level than the other science agencies, the National Agricultural Library remains a vital factor in research advancements. Only by making available the wealth of agricultural literature can we continue to be a world leader in research advances and application. NAL will be pursuing planning in support of a coordinated nationwide network of university agriculture libraries to make this information available in the most efficient manner to all who need it.

Before I conclude, I would like to review just a few of the important contributions our people have made in the past year.

- Through genetic engineering, ARS scientists developed an antigen which would be the basis for a vaccine to protect poultry against coccidiosis -- a disease which costs producers $300 million annually.

- Two new forage grasses have been developed which combine desirable growth characteristics and palatability to lower costs and increase livestock weight gain. Seeds will be released later this year.

- Results of a biotechnology competitive research project provide the basis for a means to more quickly select superior progeny from citrus breeding programs. Basic research carried out through this competitive grant was essential to addressing a practical breeding problem.

- A computer program developed by the Kansas extension service and used by others assists beef producers to reduce risk and improve profits through better decisionmaking.

These are only a few examples of the progress we have made. With your support, these programs will continue to demonstrate a high payoff.

AGRICULTURAL RESEARCH SERVICE

Statement of Dr. Terry B. Kinney, Jr., Administrator, Agricultural Research Service, before the House Appropriations Subcommittee on Agriculture, Rural Development and Related Agencies.

Mr. Chairman, once again, as Administrator of the Agricultural Research Service (ARS), I have the pleasure of making an annual report to you and other members of the Committee on budget recommendations for the coming year. I also want to discuss some significant progress made last year by ARS in helping farmers and other users of our research solve problems; and to outline the key strategies that ARS expects to follow in carrying out our responsibilities during the next several years.

Mr. Chairman, I again want to emphasize that the Agricultural Research Service is a problem-solving organization, geared to assisting American agriculture. The nature of a particular problem determines the type of research, fundamental or applied, needed to solve the problem. Although we cooperate and work closely with State agricultural experiment stations and universities, our Agency itself is not involved with teaching. Our scientists devote their full time to research, helping solve high priority problems of farmers, ranchers and USDA action agencies.

To make sure that our Agency has a growing number of outstanding young scientists with a knowledge of the most modern research techniques, we are once again expanding our post-doctoral Research Associates Program. Last year, we recruited 50 Research Associates; this year, we are recruiting 100. Each has recently earned a Ph.D. in a discipline we need to solve specific research problems. Now the Office of Personnel Management is allowing us to employ even more post-doctoral scientists, and our field locations are taking full advantage of this opportunity.

In addition, we support 170 regular post-doctoral positions under cooperative research agreements with most of the land-grant colleges and universities.

Association with these young and enthusiastic recent post-doctorals stimulates the thinking of our more senior scientists. Bringing them on board also makes subsequent recruitment easier, since we can evaluate post-doctorals for a year or two in our own laboratories before deciding to make them offers of permanent employment.

FY 1987 Budget Request

Mr. Chairman, the ARS budget recommendation reflects a net increase of $13.5 million for research on commodity conversion and delivery and plant productivity. I am proud but cautious concerning our budget recommendation. I am proud that despite the overall tough budget situation facing the nation, Executive Branch decisionmakers have placed additional trust in ARS scientists by authorizing increased appropriations. On the other hand, my pride is

tempered by the realization that high expectations exist for our scientists to deliver answers to fundamental problems facing U.S. farmers--what to do about crop surpluses and high production costs. Given these problems' complexity and magnitude, it is a tremendous responsibility. Given our track record for solving problems and the commitment to excellence of ARS scientists, I'm optimistic about the challenge. We will need this Committee's continued support, encouragement, and guidance in meeting this additional responsibility.

I would like to highlight additional information on the increased programs. We have restored all of our program areas to pre-Gramm-Rudman levels and focused our enhancement in two essential areas. First, $10 million would be provided to develop ways to (1) utilize surplus corn, wheat, soybeans, cotton and dairy products; (2) overcome barriers for commodity exports; and (3) develop new lightly processed fruit and vegetable products.

Mr. Chairman, this is a carefully planned program of research to address the high current and projected crop and dairy surpluses and increased competition in world makets. We have consulted with industry to develop research ideas to pursue projects with market opportunities in the short- and longer-term horizon. Our objective is to provide the basis for agricultural products to penetrate new domestic and export markets and displace imports. Extensive application of advanced biotechnologies will be an important feature of this initiative. We look to the Committee for support in carrying out this research which is so vital to the future of American farmer.

Our ongoing work in the area of new and alternative crops has received increased attention as another means of assisting farmers. Much of this work is being conducted cooperatively through the State Experiment Stations.

Our second proposed increase is $3.5 million for crop germplasm evaluation and improvement. This proposal has been developed to provide information on what genetic diversity exists in our germplasm collections, to bring greater diversity into more usable genetic combinations, and to develop knowledge of how genes regulate plant growth and development and how plant gene expression is controlled.

Mr. Chairman, I cannot overemphasize the importance of this increased level of germplasm work. As you know, international political and economic developments, combined with the demands on the environment of an increasing world population, have threatened the availability of genetic diversity essential to further improvements in crop plants. Significant advances in genetic transfer technology and other biotechnologies offer the potential for future improvements in disease and drought tolerance, productivity and quality --but only if we have the basic genetic materials to utilize. Crop improvements in these areas have the potential to reduce the need for costly inputs of chemicals, fertilizer, and water while at the same time conserving our valuable natural resources.

We are prepared to provide the Committee whatever additional information you may require to support our requests in these two vital activities.

ARS Challenges and Accomplishments

As the national agricultural research agency, ARS must address the immediate problems facing U.S. agriculture--high farm production costs and loss of export markets. Current research is focused on developing improved production practices to maintain and ensure crop productivity and reduce costs; to conserve natural resources by controlling erosion and maintaining groundwater quality; to control important animal diseases such as avian influenza and brucellosis; to maximize use of agricultural products for domestic and export market; and to promote human health and well being through improved nutrition.

ARS scientists were able to make significant progress last year in all these areas. Specific examples of achievement are:

o A computer program developed by ARS in Mississippi that helps cotton growers make better crop management decisions, thus reducing crop losses and production costs by an estimated 10 percent. This existing program is a cooperative effort of Mississippi State University, Clemson University, the Cotton Foundation, farmers, and industry.

o Development of a genetically engineered antigen that helps protect chickens against a parasite that causes coccidiosis, an intestinal disease of poultry that costs the industry $300 million a year. The work was done at Beltsville in cooperation with a private biotechnology firm, which has a patent on the antigen. It is being evaluated by a commercial pharmaceutical house for market potential.

o A cross of fescue and ryegrass called Johnstone fescue, developed by ARS in Kentucky, that combines long life and resistance to stress with the palatability of ryegrass. The result is a 30 to 50 percent increase in daily weight gain for cattle. Through a special agreement between ARS and the Kentucky Agricultural Experiment Station, a quantity of seed has been made available, by license, to a Kentucky seed company for commercial production.

o Surge irrigation, a technology that reduces farmer costs by using less water and energy while maintaining high crop yields. It is being adopted rapidly by farmers in the Southern High Plains.

o Heat tolerant varieties of Pima cotton that result in a 50 percent increase in commercial yields at lower elevations in Arizona. U.S. exports of this long-staple, premium cotton have increased during the last 5 years.

o The virtual elimination of yellow dwarf virus on oats, which once destroyed 25 to 30 percent of the crop in the Northern United States, by using resistant germplasm lines. The program now aims to incorporate similar resistance in barley and winter wheat.

o A quarantine treatment schedule for in-shell walnuts that is expected to permit export of walnuts to Japan this year for the first time. Walnuts have been barred because they are considered a host of codling moth.

o Applications to fruit trees of an experimental chemical that controls growth, increases fruit quality and quantity, and reduces the need for hand pruning. Registration for commercial use appears likely.

o In Florida, a special process for debitterizing early season grapefruit juice and navel orange juice that offers potential savings for the citrus industry. A Florida processor has agreed to evaluate the process, which uses a byproduct of the corn sugar industry.

o Granola-type bars containing 12 percent guar gum that reduced the need for insulin in both men and women with adult-onset diabetes. Five guar bars a day, eaten before meals for 6 months by test patients, helped slow down absorption of carbohydrates and smoothed out blood glucose levels between meals.

o Collecting white blood cells needed for research on infectious diseases and vaccines in a hollow sphere implanted easily under the skin of research animals. Thanks to this ARS research at Auburn, Alabama, it is no longer necessary to bleed the animals repeatedly or to sacrifice them.

o Experiments to improve the efficiency, effectiveness, and acceptability of intransit, shipboard fumigation and to demonstrate the effectiveness of a new chemical protectant. The result is two new alternatives for control of insect infestations of U.S. wheat, corn, and soybeans that have impressed even our most exacting customer, the U.S.S.R. Use of these new procedures will greatly increase the image and quality of our grain exports.

o The discovery that vitamin C, a dietary antioxidant, will protect the human eye against light-induced lens damage that occurs with age. This research should lead to dietary recommendations which serve to enhance the quality of life of our elderly through the prolongation of optimal vision.

o Mozark, a new variety of fescue that eliminates a toxic fungus, could save livestock producers an estimated $63 million a year in Missouri alone. Pasture trials of the tall grass resulted in a 30 percent increase in average daily weight gains for calves and yearlings. Small amounts of the seed stocks will be released to growers this fall.

Operational Strategy

Mr. Chairman, as you have emphasized and we fully agree, ARS must concentrate available resources on high-priority national problems that others cannot or will not address. Given the continuing constraint on resources and complexity of research problems facing the farming community, I believe ARS must be guided by some very fundamental program management strategies. I plan to give special emphasis to program relevance and technology transfer.

o We will continue to address technical problems that are determined to be the most critical to the U.S. food and agricultural sector. To increase program relevance, we must continue to improve our communication with research user groups and policymakers, including you and members of your committee, and focus our resources on fewer problems to maximize the probability of success. Only in this way we will achieve the most effective use of our resources. Our $10 million initiative in the commodity conversion area exemplifies this approach.

o We will further strengthen our communication networks and data management systems to support research programs and facilitate technology transfer. Computer models of crop and animal production, soil erosion, and other systems are becoming useful vehicles for expressing the state-of-the-art of many areas of scientific research. Agriculture is rapidly moving toward using both models and expert systems on the farm, in government, and in agribusiness.

This concludes my prepared remarks. Before closing, however, I want to thank you, Mr. Chairman, and Members of this Committee for the steadfast support you have provided over the years. We appreciate your support and guidance. I will be pleased to answer questions you may have.

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AGRICULTURAL RESEARCH SERVICE

Purpose Statement

Agricultural Research Service was established on November 2, 1953, pursuant to authority vested in the Secretary of Agriculture by 5 U.S.C. 301 and Reorganization Plan No. 2 of 1953, and other authorities.

The research performed by Agricultural Research Service (ARS) is authorized by the Department of Agriculture Organic Act of 1862 (5 U.S.C. 511), the Research and Marketing Act of 1946, as amended (7 U.S.C. 427,1621) the Agriculture and Food Act of 1981 (7 U.S.C. 1281), and the Food Security Act of 1985 (P.L. 99-198).

Agricultural Research Service is responsible for conducting basic, applied and developmental research on:

--Soil and Water Conservation
--Plant Productivity
--Animal Productivity
--Commodity Conversion and Delivery
--Human Nutrition
--Integration of Agricultural Systems

The research applies to a wide range of goals; commodities; natural resources; fields of science; and geographic, climatic, and environmental conditions.

As the U.S. Department of Agriculture's in-house agricultural research agency, ARS has major responsibilities for conducting and leading the national agricultural research effort. ARS provides initiative and leadership in five areas:

* Research on broad regional and national problems.
* Research to support Federal action and regulatory agencies.
* Expertise to meet national emergencies.
* Research support for international programs.
* Scientific resource to the Executive Branch and Congress.

The mission of ARS research is to develop new knowledge and technology which will insure an abundance of high quality agricultural commodities and products at reasonable prices to meet the increasing needs of an expanding economy and to provide for the continued improvement in the standard of living of all Americans. This mission focuses on the development of technical information and technical products which bear directly on the needs to (1) manage and use the Nation's soil, water, air, and climatic resources, and improve the Nation's environment; (2) provide an adequate supply of agricultural products by practices that will maintain a permanent and effective agriculture; (3) improve the nutrition and well-being of the American people; (4) improve living in rural America; and (5) strengthen the Nation's balance of payments.

Research is conducted at numerous field locations in the States, District of Columbia, Puerto Rico, the Virgin Islands, and in several foreign countries. Much of the work is conducted in direct cooperation with the State agricultural experiment stations, other State and Federal agencies, and private organizations.

Central offices of ARS are in the Washington, D.C. Metropolitan Area. The field activities are managed on a national basis through 11 Area Offices. Activities are carried out at 135 separate field locations. As of September 30, 1985, there were 7,371 full-time employees and 1,112 other than full-time employees. Of the total, 465 full-time employees and 54 other than full-time employees worked in the headquarters office.

AGRICULTURAL RESEARCH SERVICE

Available Funds and Staff-Years

Actual 1985, and Estimated 1986 and 1987

Item	1985 Actual		1986 Estimated		1987 Estimated	
	Amount	Staff-Years	Amount	Staff-Years	Amount	Staff-Years
Direct Appropriation:						
Agricultural Research Service	$489,947,000	8,170	$499,561,000	8,158	$513,053,000	8,218
Buildings and Facilities	22,350,000	- -	6,312,000	- -	- -	- -
Total, Direct Appropriation	512,297,000	8,170	505,873,000	8,158	513,053,000	8,218
Deduct Allotments to Other Agencies:						
Forest Service	-355,357	- -	-386,000	- -	-386,000	- -
Net	511,941,643	8,170	505,487,000	8,158	512,667,000	8,218
Obligations from other USDA Appropriations:						
Agricultural Marketing Service	115,468	- -	150,000	- -	150,000	- -
Animal and Plant Health Inspection Service	5,345,076	56	5,500,000	56	5,500,000	56
Federal Grain Inspection Service	263,475	1	300,000	1	300,000	1
National Agricultural Library	502,139	- -	525,000	- -	525,000	- -
Forest Service	152,948	- -	200,000	- -	200,000	- -
Food Safety and Inspection Service	1,434,683	2	1,500,000	2	1,500,000	2
Human Nutrition Information Service	102,351		150,000		150,000	
Office of International Cooperation and Development	504,918	1	550,000	1	550,000	1
Soil Conservation Service	607,588	2	600,000	2	600,000	2
Cooperative State Research Service	724,454	1	800,000	1	800,000	1
Miscellaneous Reimbursements	375,744	1	425,000	1	425,000	1
Total, Other USDA Funds	10,128,844	64	10,700,000	64	10,700,000	64
Total, Agriculture Appropriations	522,070,487	8,234	516,187,000	8,222	523,367,000	8,282

Available Funds and Staff-Years

Actual 1985, and Estimated 1986 and 1987

Item	1985 Actual		1986 Estimated		1987 Estimated	
	Amount	Staff-Years	Amount	Staff-Years	Amount	Staff-Years
Other Federal Funds:						
Department of Defense	$ 736,516	4	$ 750,000	4	$ 750,000	4
Department of Energy	600,553	2	601,000	2	601,000	2
Department of Health and Human Services	2,071,299	8	2,100,000	8	2,100,000	8
Department of Interior	185,377	1	185,000	1	185,000	1
Department of Commerce	300,000	- -	300,000	- -	300,000	- -
Environmental Protection Agency	775,422	2	776,000	2	776,000	2
Miscellaneous Reimbursement	187,733	- -	188,000	- -	188,000	- -
Total, Other Federal Funds	4,856,900	17	4,900,000	17	4,900,000	17
Non-Federal Funds:						
State of California	286,937	1	300,000	1	300,000	1
Binational Agriculture Research & Development Agreement (BARD)	536,428	5	600,000	5	600,000	5
Quarters and Subsistence	190,647	- -	200,000	- -	200,000	- -
Miscellaneous Reimbursement	917,506	1	1,100,000	1	1,100,000	1
Miscellaneous Contributed Funds	469,646	4	1,200,000	4	1,200,000	4
Total, Non-Federal Funds	2,401,164	11	3,400,000	11	3,400,000	11
Total, Agricultural Research Service	529,328,551	8,262	524,487,000	8,250	531,667,000	8,310

Full-Time Equivalent Staff-Years:	1985 Actual	1986 Estimated	1987 Estimated
Ceiling	8,112	8,100	8,160
Non-Ceiling	150	150	150
Total	8,262	8,250	8,310

AGRICULTURAL RESEARCH SERVICE

CLASSIFICATION BY OBJECTS

1985 and Estimated 1986 and 1987

	1985 Actual	1986 Estimated	1987 Estimated
Personnel Compensation:			
Headquarters	$ 17,770,139	$ 18,400,000	$ 18,584,000
Field	223,744,826	225,142,000	229,210,000
11 Total Personnel Compensation	241,514,965	243,542,000	247,794,000
12.0 Personnel Benefits	30,545,670	31,359,000	31,907,000
13.0 Benefits for Former Personnel	489,502	- -	- -
Total Pers. Comp. & Benefits	272,550,137	274,901,000	279,701,000
Other Objects:			
21.0 Travel and transportation of persons	7,346,626	7,307,000	7,550,000
22.0 Transportation of things	1,140,318	1,290,000	1,333,000
23.2 Communications, utilities and other rents	29,049,426	30,765,000	31,794,000
24.0 Printing and reproduction	970,767	1,057,000	1,092,000
25.0 Other services	101,164,139	102,834,000	106,036,000
26.0 Supplies and materials	38,786,311	43,263,000	44,709,000
31.0 Equipment	30,966,773	31,712,000	32,705,000
32.0 Lands and structures	16,575,772	70,220,000	19,677,000
41.0 Grants, subsidies, and contributions	1,736,667	1,737,000	1,737,000
Total other objects	227,836,799	290,185,000	246,633,000
Total obligations	500,386,936	565,086,000	526,334,000
Position Data:			
Average Salary, ES positions	$67,274	$68,700	$68,700
Average Salary, GS positions	$29,651	$30,075	$30,376
Average Grade, GS positions	9.45	9.45	9.45
Average Salary of Ungraded positions	$21,756	$22,354	$22,578

NOTE: Includes Regular and Buildings and Facilities Appropriations.

AGRICULTURAL RESEARCH SERVICE

The estimates include proposed changes in the Language of this item as follows: (new language underscored; deleted matter enclosed in brackets).

Agricultural Research Service

For necessary expenses to enable the Agricultural Research Service to perform agricultural research and demonstration relating to production, utilization, marketing, and distribution (not otherwise provided for), home economics or nutrition and consumer use, [and to coordinate and provide program leadership for higher education work of the Department,] and for acquisition of lands by donation, exchange, or purchase at a nominal cost not to exceed $100; [$497,561,000] $511,053,000: Provided, That appropriations hereunder shall be available for [field] temporary employment pursuant to the second sentence of section 706(a) of the Organic Act of 1944 (7 U.S.C. 2225), and not to exceed $115,000 shall be available for employment under 5 U.S.C. 3109: Provided further, That funds appropriated herein can be used to provide financial assistance to the organizers of national and international conferences, if such conferences are in support of agency programs: Provided further, That appropriations hereunder shall be available for the operation and maintenance of aircraft and the purchase of not to exceed one for replacement only: Provided further, That uniform allowances for each uniformed employee of the Agricultural Research Service shall not be in excess of $400 annually: [Provided further, That of the appropriations hereunder not less than $10,526,600 shall be available to conduct marketing research:] Provided further, That appropriations hereunder, shall be available pursuant to 7 U.S.C. 2250 for the construction, alteration, and repair of buildings and improvements, but unless otherwise provided the cost of constructing any one building shall not exceed [$150,000] $169,000, except for headhouses connecting greenhouses which shall each be limited to $500,000, and except for ten buildings to be constructed or improved at a cost not to exceed [$275,000] $325,000 each, and the cost of altering any one building during the fiscal year shall not exceed 10 per centum of the current replacement value of the building or [$150,000] $169,000, whichever is greater: Provided further, That the limitations on alterations contained in this Act shall not apply to a total of [$250,000] $325,000, for facilities at Beltsville, Maryland: Provided further, That the foregoing limitations shall not apply to replacement of buildings needed to carry out the Act of April 24, 1948 (21 U.S.C. 113a): Provided further, That the limitation on purchase of land shall not apply to the purchase of land at Fresno, California [, or to an option to purchase land at Florence, South Carolina, for a term of not to exceed one year; Provided further, That the limitations on construction contained in this Act shall not apply to the establishment of National Clonal Germplasm Repository for Citrus, Riverside, California: Provided further, That not to exceed $200,000 of this appropriation may be transferred to and merged with the appropriation for the Office of the Assistant Secretary for Science and Education for the scientific review of international issues involving agricultural chemicals and food additives].

Special fund: To provide for additional labor, subprofessional, and junior scientific help to be employed under contracts and cooperative agreements to strengthen the work at Federal research installations in the field, $2,000,000.

Explanation of Changes

The first change would delete language pertaining to the Higher Education Programs of this Agency. These activities were transferred in FY 1985 to the Office of Grants and Programs Systems which is funded under the Cooperative State Research Service appropriation. This language will not be required in FY 1987.

The second change would reflect more emphasis on temporary employment in the field as is intended by Section 706 (a) of the Organic Act of 1944 (7 U.S.C. 2225).

The third change would delete language pertaining to the funding level of marketing research. The $10,526,600 funding level is no longer pertinent since ARS provides a significantly higher level of funding.

The fourth change would increase the cost limitation on (1) construction of any one building (except headhouses connecting greenhouses) from $150,000 to $169,000; (2) construction of ten buildings from $275,000 to $325,000 each; and (3) altering any one building during the fiscal year from $150,000 to $169,000.

The construction cost limitation on buildings should be increased in fiscal year 1987 to maintain the previous values of these authorizations. Increases requested are derived from conservative estimates of cost changes for construction of specialized research laboratories and associated support facilities applicable in the construction industry and in anticipation of a 10% inflation and escalation of construction costs in FY 1987 for these specialized type of facilities.

The fifth change would increase the cost limitation specifically for Beltsville. This is necessary to maintain the previous values of this authorization. The increase requested is derived from conservative estimates of cost changes for construction of specialized research laboratories and associated support facilities applicable in the construction industry and in anticipation of a 10% inflation and escalation of construction costs in FY 1987 for these specialized type of facilities.

The sixth change would delete language for an option to purchase land adjacent to the ARS Coastal Plains Soil and Water Conservation Research Center, Florence, South Carolina. Option to purchase land will be accomplished in FY 1986. This language will not be required in FY 1987.

The seventh change would delete language for the exceptions to the construction limitations for the establishment of a National Clonal Germplasm Repository for Citrus, Riverside, California. Construction of this facility will commence in FY 1986. This language will not be required in FY 1987.

The eighth change would delete language pertaining to transfer of funds to the Office of the Assistant Secretary for Science and Education for the scientific review of international issues involving agricultural chemicals and food additives. This language will not be required in FY 1987.

AGRICULTURAL RESEARCH SERVICE

Appropriation, 1986	$503,043,000
Budget Estimate, 1987	513,053,000
Increase in Appropriation	+10,010,000

Adjustments in 1986:		
Appropriation Act, 1986	$503,043,000	
Less Pro-Rata Reduction, P.L. 99-190	-3,018,000	
Net Appropriations	500,025,000	
Transfer to Departmental Administration a/	-159,000	
Transfer to Departmental Administration and Office of Governmental and Public Affairs for Reimbursable Activities b/	-305,000	
Adjusted base for 1986		499,561,000
Budget Estimate, 1987		513,053,000
Increase over Adjusted 1986		+13,492,000

a/ Transfer of Minority Affairs to the Office of Advocacy and Enterprise.
b/ A transfer of $242,000 to Departmental Administration and $63,000 to Office of Governmental and Public Affairs is to fund activities previously financed on a reimbursable basis as a direct appropriation in FY 1987.

SUMMARY OF INCREASES AND DECREASES
(on basis of adjusted appropriation)

Projects	1986 Estimated	Program Charges	1987 Estimates
Germplasm evaluation	$2,693,000	+$1,500,000	$4,193,000
Gene transfer and germplasm enhancement	6,941,000	+1,992,000	8,933,000
Develop new and value-added dairy products (food and non-food)	400,000	+1,500,000	1,900,000
Develop new and value-added products from corn, wheat, cotton and soybeans (food and non-food)	1,070,000	+3,000,000	4,070,000
Reduce losses and remove barriers to commodity exports	790,000	+3,000,000	3,790,000
Develop new lightly processed fruit and vegetable products	500,000	+2,500,000	3,000,000
All Other	487,167,000	- -	487,167,000
Total Available	499,561,000	+13,492,000	513,053,000

Project Statement
(on the basis of adjusted appropriation)

Project	1985 Actual Amount	1985 Actual Staff Years	1986 Estimated Amount	1986 Estimated Staff Years	Increase or Decrease	1987 Estimated Amount	1987 Estimated Staff Years
1. Research on soil and water conservation	$60,003,434	995	$62,078,000	993	- -	$62,078,000	993
2. Research on plant productivity	189,699,766	3,430	193,054,000	3,427	+$3,492,000(1)	196,546,000	3,442
3. Research on animal productivity	88,829,105	1,629	91,720,000	1,627	- -	91,720,000	1,627
4. Research on commodity conversion and delivery	90,882,876	1,702	93,027,000	1,700	+10,000,000(2)	103,027,000	1,745
5. Human nutrition research	36,500,243	231	39,459,000	230	- -	39,459,000	230
6. Integration of agricultural systems	10,357,472	183	8,203,000	181	- -	8,203,000	181
7. Repair and maintenance of facilities	10,236,000	- -	11,026,000	- -	- -	11,026,000	- -
8. Contingencies	a/	- -	994,000	- -	- -	994,000	- -
Unobligated balance	3,438,110	- -	- -	- -	- -	- -	- -
Total available or estimate	489,947,000	8,170	499,561,000	8,158	+13,492,000	513,053,000	8,218
Transfer to Departmental Administration	159,000	- -	159,000	- -			
Transfer to Departmental Administration and Office of Governmental and Public Affairs	- -	- -	305,000	- -			
Transfer to CSRS	7,800,000	- -	- -	- -			
Total, Appropriation	497,906,000	8,170	500,025,000	8,158			

a/ Obligations for the $1,000,000 appropriated in 1985 are reflected in the above programs.
b/ Transfer of $3,000,000 for higher education graduate fellowships, $2,000,000 for strengthening grants at 1890 Colleges and Universities, Tuskegee University and the University of the District of Columbia, and $2,800,000 Morrill-Nelson (permanent appropriation) to the Cooperative State Research Service.

AGRICULTURAL RESEARCH SERVICE

Explanation of Program

Under the Agriculture, Rural Development and Related Agencies Appropriations, the Agricultural Research Service develops the means for:

1. Managing and conserving the Nation's soil and water resources for a stable and productive agriculture. -- Research is conducted to develop the technology for assessing and predicting long-term changes in the quantity and quality of soil, water, and air resources available to agriculture; to provide the technology needed for improving, protecting, and restoring the productive capacity of agricultural soils; to develop improved water-management systems and practices to achieve effective and efficient use of water resources; and to develop subsystems and models that integrate the use of soil, water, and air resources for optimum management of major land resource areas.

2. Maintaining and increasing the productivity and quality of crop plants. -- Research is conducted to broaden the germplasm resources of plants and beneficial organisms to ensure maximum genetic diversity for improved productivity; to select and modify germplasm of plants, beneficial organisms, and pests; to develop improved production practices for maintaining and increasing crop productivity and quality and for reducing costs; to discover principles and develop improved methods for reducing crop losses caused by weeds, diseases, insects, nematodes, and other pests; and to develop improved methods for integrating the crop- and pest-management practices needed for higher and more stable levels of crop production.

3. Increasing the productivity of animals and the quality of animal products. -- Research is conducted to increase the genetic capacity of animals for production; to improve the efficiency of reproduction and reproduction-related biological processes; to improve animal nutrition and feed efficiency to increase productivity and product quality; to develop ways to prevent or control losses from diseases, parasites, and toxicants and other substances that limit animal performance and reduce the quality of animal products; to develop means for controlling insects, ticks, and mites that affect animals and man; and to devise means for improving and integrating procedures and facilities for production and transport of animals to increase productivity, reduce costs, and minimize stresses.

4. Achieving maximum use of agricultural products for domestic markets and export. -- Research is conducted to develop means for enhancing the inherent properties and uses of agricultural materials; to develop the means for meeting foreign and domestic user and regulatory requirements relating to toxic factors in food, feed, and other agricultural products; to develop means for reducing or eliminating postharvest losses caused by pests, spoilage, and physical and environmental damage; and to develop the means for increasing efficiency of systems for processing, handling, storing, and distributing agricultural products.

5. Promoting optimum human health and well-being through improved nutrition and family resource management. -- Research is conducted to define the nutrient requirements of humans at all stages of the life cycle; to determine the nutrient content of agricultural commodities and processed foods as eaten, and establish the bioavailability of their nutrients; and to improve the nutritional status of humans and the well-being of families by making techniques available for assessing the effectiveness of nutrition and home economics programs.

6. Integrating scientific knowledge of agricultural production, processing, and marketing into systems that optimize resource management and facilitate transfer of technology to users. -- Research is conducted to develop integrated systems for efficiently producing, processing, and marketing agricultural products; and to develop alternative agricultural systems, including those of small scale, that are less dependent upon nonrenewable resources and that are productive, efficient, and sustainable in the long term.

7. Repair and maintenance of facilities. -- Funds are used to repair and maintain ARS facilities to provide safe, energy-efficient and functional workspace for in-house research. In addition to this national program which focuses primarily on safety and energy retrofit projects, ARS is committed to adequately funding routine maintenance and repair. To assure that all facilities are properly maintained, each location allocates program funds as appropriate to perform the most pressing needs.

The research performed by Agricultural Research Service (ARS) is authorized by the Department of Agriculture Organic Act of 1862 (5 U.S.C. 511), the Research and Marketing Act of 1946, as amended (7 U.S.C. 427, 1621) the Agriculture and Food Act of 1981, (7 U.S.C. 1281), and the Food Security Act of 1985 (P.L. 99-198).

(1) An increase of $3,492,000 for research on plant productivity consisting of:

(a) An increase of $1,500,000 for germplasm evaluation ($2,693,000 available in FY 1986).

Need for Change. Crop productivity is essential to the economic and political well-being of this and other countries. Improvements in crop production efficiency are dependent upon a strong base of agricultural research. Of specific importance are those areas of research which combine to provide the basis for genetic improvement of important plant species. In order to provide genetic diversity to increase crop productivity and reduce genetic vulnerability in future food and agriculture development, it is necessary to acquire, maintain, evaluate, and make readily accessible to plant breeders and other plant scientists as wide as possible a range of genetic diversity in the form of seed and clonal germplasm. Thus, it is essential to acquire and preserve the valuable germplasm of our economic plants and their wild relatives.

Nature of Change. Evaluation research will identify the desired genetic diversity in our germplasm collections, provide basic information on what diversity exists, and how it is distributed within the collections. Evaluations will be made in accordance with prioritized lists of descriptors and characteristics developed by specific germplasm Crop Advisory Committees. Results of the evaluations will be loaded into and disseminated from the Germplasm Resources Information Network.

(b) An increase of $1,992,000 for gene transfer and germplasm enhancement ($6,941,000 available in FY 1986).

Need for Change. Reducing genetic vulnerability of economic crop plants, while improving their capacity to provide quality products at lower unit costs, requires that plant breeders and genetic engineers have a wide array of genetic diversity with which to work. Evaluation research will provide the basic information on what genetic diversity exists in our germplasm collections, but germplasm enhancement is essential to bring this diversity into utilizable genetic combinations. Modern germplasm enhancement is dependent upon research to develop techniques for the control of plant gene expression and for plant gene characterization and transfer. Recently developed biotechnology techniques must be integrated with conventional techniques to assure improved crop growth and yield, product quality, and biological resistance to pests and environmental stress factors.

Nature of Change. Research will be conducted to develop strategies and technologies required for the efficient, precise, and operative transfer of desired genes into economically important crop plants. This ultimately demands the development of basic knowledge of how genes regulate plant growth and development and how plant gene expression is controlled. Emphasis will be on (1) developing new molecular biology methodologies to develop gene structures, transfer vectors, and gene expression control; and (2) introgression (by all available methods) of exotic and domestic germplasm having uniquely beneficial characters into enhanced germplasm of value to plant breeders and, ultimately, to producers and consumers.

(2) An increase of $10,000,000 for research on commodity conversion and delivery consisting of:

(a) An increase of $1,500,000 to develop new and value added dairy products -food and nonfood ($400,000 available in FY 1986).

Need for Change. Milk surpluses removed from the market by USDA now average about 17 million pounds annually. Furthermore, technologies to increase milk production per cow will soon be available. A major limitation in the export of fluid milk to deficient areas, such as South America and other developing countries, is the cost of liquid volume distribution, i.e., water, and the inability to produce a sterile milk concentrate that does not irreversibly gel with exposure to temperature and time. Another major deterrent to Third World acceptance and use of milk is its lactose content. Research is urgently needed to develop innovative new approaches to consumer, industrial and export markets for this surplus milk.

Nature of Change. The requested increase would be used to develop biotechnologies to convert milk components to new food forms and value-added chemicals, and to eliminate impediments in current domestic and export markets, such as cholesterol and lactose. Novel, economic separation technologies will be developed to expand the market opportunities for milk proteins and sugars as functional ingredients in food systems and industrial processes. The combination of milk solids with other surplus commodities that have unique functional and nutritional properties, such as, partially defatted peanut or rice flours, offer the opportunity to devise product concepts that fit specific market requirements and opportunities. Funds will be used to devise such product concepts that can be flavored, colored, and packaged as deemed appropriate by industry.

Milk solids are usually consumed in either fluid or fermented forms, i.e., cheese or yogurt. Ice cream is the only major product in which physical and physical chemical phenomena are the primary means used to achieve the desired form and texture. Funds will be devoted to the exploration of novel physical (e.g., irradiation, microwave, freeze texturization) and of physical chemical principles to develop forms consistent with export transportation and delivery requirements and with acceptability to developing world populations.

(b) An increase of $3,000,000 for development of new and value-added products from corn, wheat, cotton, and soybean $1,070,000 available in FY 1986).

Need for Change. The U.S. surplus situation has not eased; massive surpluses are projected for corn, cotton, wheat, and soybeans, partly as a function of shrinking export markets. Emerging new technologies offer a major opportunity to provide means within a reasonable time frame to convert corn, wheat, cotton, and soybeans, or their major components (starches, oils, and proteins) to value-added products which can enter new bulk chemical markets and expand our export markets and decrease imports. Research is essential to take full advantage of those opportunities to reduce surpluses.

AGRICULTURAL RESEARCH SERVICE

Permanent Positions by Staff-Year Summary

1985 Actual, 1986 Estimate and 1987 Estimate

Grade	1985 Actual			1986 Estimate			1987 Estimate		
	Headquarters	Field	Total	Headquarters	Field	Total	Headquarters	Field	Total
ES-6	1	--	1	1	--	1	1	--	1
ES-5	3	2	5	3	3	6	3	3	6
ES-4	3	20	23	3	19	22	3	19	22
ES-3	--	4	4	1	4	5	1	4	5
ES-2	1	1	2	--	1	1	--	1	1
ES-1	--	1	1	--	1	1	--	1	1
GS-17	--	--	--	--	--	--	--	--	--
GS-16	3	2	5	3	2	5	3	2	5
GS/GM-15	38	334	372	38	303	341	38	312	350
GS/GM-14	30	621	651	30	605	635	30	608	638
GS/GM-13	100	815	915	100	792	892	100	797	897
GS-12	86	815	901	86	792	878	86	797	883
GS-11	24	537	561	28	536	564	28	541	569
GS-10	--	18	18	--	17	17	--	19	19
GS-9	20	750	770	25	716	741	25	721	746
GS-8	8	249	257	8	243	251	8	248	256
GS-7	40	720	760	44	687	731	44	690	734
GS-6	78	456	534	81	440	521	81	443	524
GS-5	40	790	830	44	765	809	44	770	814
GS-4	42	376	418	46	361	407	46	364	410
GS-3	13	131	144	18	122	140	18	123	141
GS-2	5	12	17	6	11	17	6	11	17
GS-1	--	--	--	--	--	--	--	--	--
Positions at rates established by Act June 20, 1958 (U.S.C. 3104)...	--	14	14	--	37	37	--	37	37

Permanent Positions by Staff-Year Summary

1985 Actual, 1986 Estimate and 1987 Estimate

Grade	1985 Actual			1986 Estimate			1987 Estimate		
	Headquarters	Field	Total	Headquarters	Field	Total	Headquarters	Field	Total
Grade Established under Foreign National Pay Plan	--	24	24	--	24	24	--	24	24
Ungraded Positions	9	901	910	9	882	891	9	888	897
Total Permanent Positions	544	7593	8137	574	7363	7937	574	7423	7997
Staff-Years:									
Ceiling	555	7557	8112	569	7531	8100	569	7591	8160
Non-Ceiling	10	140	150	10	140	150	10	140	150
TOTAL	565	7697	8262	579	7716	8250	579	7731	8310

Nature of Change. The technologies to be employed include utilization of microbial and enzyeme engineering to carry out chemical reactions essential to conversions which are not now possible. These activities involve genetic engineering of microbial, plant, and animal cells to perform conversion and chemical production functions necessary for novel chemical production concepts; and nontraditional means of product separations and recoveries to provide a competitive process cost to leverage economic demand of newly formed chemicals and/or products.

(c) An increase of $3,000,000 to reduce losses and remove barriers to commodity exports ($790,000 available in FY 1986).

Need for Change. Challenges to the market position of U.S. agricultural commodities are multinational and multifold. Insects, moisture, chemical residues, disease, grade and quality characteristics such as oil or protein contents, color, flavor, and mycotoxins influence the value and acceptance of U.S. commodities. Research to eliminate barriers and to objectively measure and control losses in an effective and economic manner is essential to increased volume and value of U.S. exports.

Nature of Change. The requested increase would be used to address both animal and crop commodity problems including quality issues and action agency priorities. Research approaches to achieve this goal include development of: new, objective technologies to measure moisture, grading factors, and quality determinants and to demonstrate the absence of pests. We will develop technologies to enhance establishment of pest free zones for quarantine treatments, as well as, economic technologies based on biological and biochemical control to prevent decay and disease and provide quality in exports.

In particular, we will focus on the use of radiation as an alternative to fumigants as a quarantine treatment method while preserving product quality, the development of on-farm pest controls that contribute to improved export potential, and alternative means to increase fresh meat shelf life. The work will also include new grading technologies for grain, peanuts, and moisture; studies to ascertain the regulatory role of cell wall constituents in quality loss, and the identification and regulation of the formation of toxic fungal metabolites on grain. Expansion of these programs will increase our direct support of APHIS, FSIS, and FGIS.

(d) An increase of $2,500,000 to develop lightly processed fruit and vegetable products ($500,000 available in FY 1986).

Need for Change. Lucrative produce markets, domestic and foreign, can be expanded by satisfying the new trend in consumer demand for lightly processed fruit and vegetables. However, no techniques or technological concepts other than fruit juices currently exist and the safety of previously accepted preservation technologies such as sulfur dioxide are being questioned. Research is urgently needed to develop new food preservation concepts in an area where the technical knowledge is virtually nonexistent.

Nature of Change. The requested increase will be used to develop methods to provide lightly processed fruits and vegetables which meet buyer's quality demands, safety standards and shelf-life needs. Control of moisture loss and of physiological response to cellular disruption is essential to development of acceptable products. This requires a basic understanding of cellular membrane permeability and the enzymatic, phytoalexin and hormonal response to rupture. Novel physical and/or enzymatic means will be developed to control moisture loss and physiological response to cell rupture, including browning, and novel physical, enzymatic or biotechnological means for separation of intact cells or segments of fruits and vegetables. Funds will be devoted to resolution of these problems for those fruits and vegetables with greatest market potential.

CONTINGENCY RESEARCH FUND

The Contingency Research Fund, established by Congress in Fiscal Year 1962, is designed to provide a ready source of funds to meet unforeseen and immediate research needs. Releases from the fund are generally made in situations where an emergency exists, or for special needs such as an unexpected scientific "breakthrough," or for new diseases or pest problems where it appears inadvisable to wait for consideration of a request for funds for the project in the regular budget process. In allocating funds, the procedure is to make no commitments for allocations from the fund beyond the current year.

	1985 Obligations
Replacement of Animal Buildings destroyed by fire, Beltsville, Maryland	$ 467,000
Mechanisms of pathogenesis and interim control of disease of sugarbeets, Rhizomania, Salinas, California	50,000
Emergency replacement of water well at Southeastern Fruit and Tree Nut Research Laboratory, Byron, Georgia	50,000
Freeze damage to ongoing experiments used for citrus canker research, Orlando, Florida	40,000
Emergency repair of main air conditioning unit at Sedimentation Laboratory, due to freeze damage, Oxford, Mississippi	8,000
Emergency repair of heating and cooling system in R. W. Harned Research Laboratory due to freeze damage, Mississippi State, Mississippi	33,600
Emergency replacement of water well at Moxee Research Farm used for irrigation, Yakima, Washington	70,000
Replacement of fire hydrants due to safety review that disclosed serious fire hazards, Mississippi State, Mississippi, and Houma, Louisiana	36,000
Emergency repair to irrigation system for plant specimens at National Arboretum, Washington, D. C	25,000
Emergency repairs to buildings and structures at the U. S. Small Fruits Research Station severely damaged by Hurricane Elena, Poplarville, Mississippi	13,500
Repair of instrumentation used at the Weather Station which was damaged by electrical storm, Mississippi State, Miss	20,800
Emergency repair to main air conditioning system, Mississippi State, Mississippi	90,000
Disposal of Hazardous Waste Chemicals, Brookings, South Dakota; Tifton, Georgia; Gainesville, Florida; and Houma, Louisiana	79,100
Emergency repair of water tower, Miles City, Montana	17,000
Total 1985 Obligations, Contingency Research Fund	1,000,000

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

(On basis of adjusted appropriation)

Location	Actual 1985		Estimated 1986		Estimated 1987	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
ALABAMA, Auburn	$2,475,144	46	$2,505,500	46	$2,505,500	46
ALASKA, Fairbanks	762,210	4	736,900	4	736,900	4
ARIZONA						
Phoenix	5,034,934	106	5,010,900	106	5,010,900	106
Tucson	3,306,566	75	3,326,100	75	3,326,100	75
Total	8,341,500	181	8,337,000	181	8,337,000	181
ARKANSAS						
Booneville	926,117	16	973,600	16	973,600	16
Stuttgart	234,286	4	226,900	4	361,900	5
Total	1,160,403	20	1,200,500	20	1,335,500	21
CALIFORNIA						
Albany	16,932,951	318	16,537,100	318	18,067,100	327
Brawley	343,402	9	365,400	9	365,400	9
Davis	1,214,890	20	1,067,400	20	1,067,400	20
Fresno	4,128,132	58	3,301,200	58	3,436,200	59
Pasadena	1,952,237	28	1,938,100	28	1,938,100	28
Riverside	3,007,294	62	3,426,100	62	3,426,100	62
Salinas	1,595,203	33	1,494,300	33	1,494,300	33
San Francisco	3,028,999	19	3,394,900	19	3,394,900	19
Shafter	1,249,080	24	1,224,900	24	1,224,900	24
Total	33,452,188	571	32,749,400	571	34,414,400	581
COLORADO						
Akron	774,904	16	739,500	16	739,500	16
Denver	2,235,178	5	—	—	—	—
Fort Collins	7,233,484	133	6,817,600	133	6,817,600	133
Total	10,243,566	154	7,557,100	149	7,557,100	149
DELAWARE						
Georgetown	606,701	11	564,800	11	564,800	11
Newark	560,692	13	586,600	13	586,600	13
Total	1,167,393	24	1,151,400	24	1,151,400	24
DISTRICT OF COLUMBIA						
Program	3,258,249	73	3,583,200	73	3,583,200	73
Headquarters						
Agency Management Services	28,238,500	460	27,333,400	460	27,333,400	460
Centrally Financed Program	8,844,500	--	9,045,400	--	9,045,400	--
Subtotal	37,083,000	460	36,378,800	460	36,378,800	460
Total	40,341,249	533	39,962,000	533	39,962,000	533

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1985		Estimated 1986		Estimated 1987	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
FLORIDA						
Belle Glade	164,972	3	185,400	3	185,400	3
Brooksville	634,779	4	437,700	4	437,700	4
Canal Point	775,751	21	836,600	21	836,600	21
Fort Lauderdale	516,636	8	659,700	8	659,700	8
Gainesville	8,545,105	144	8,659,900	149	8,659,900	149
Lake Alfred	128,231	3	128,000	3	128,000	3
Miami	1,057,619	27	1,333,900	27	1,603,900	28
Orlando	3,548,086	60	3,813,000	60	3,813,000	60
Winter Haven	979,264	19	924,700	19	1,104,700	20
Total	16,350,443	289	16,978,900	294	17,428,900	296
GEORGIA						
Athens	10,517,004	193	10,756,700	193	11,206,700	195
Byron	1,764,098	39	1,698,100	39	1,698,100	39
Dawson	990,677	25	1,133,000	25	1,403,000	26
Experiment	403,313	4	712,000	4	847,000	5
Savannah	2,512,678	57	2,513,300	57	2,738,300	58
Tifton	6,124,076	105	5,647,600	105	5,647,600	105
Watkinsville	1,681,791	28	1,793,900	28	1,793,900	28
Total	23,993,637	451	24,254,600	451	25,334,600	456
HAWAII, Honolulu	3,193,465	42	3,005,700	42	3,275,700	43
IDAHO						
Aberdeen	736,431	6	799,500	6	799,500	6
Boise	1,034,448	19	1,057,100	19	1,057,100	19
Dubois	1,616,689	14	1,270,900	14	1,270,900	14
Kimberly (Twin Falls)	2,071,817	44	2,127,700	44	2,127,700	44
Total	5,459,385	83	5,255,200	83	5,255,200	83
ILLINOIS						
Peoria	17,799,736	320	17,878,000	320	19,318,000	327
Urbana	3,072,487	46	2,948,100	46	3,083,100	47
Total	20,872,223	366	20,826,100	366	22,401,100	374
INDIANA						
Lafayette	3,284,114	40	3,117,100	51	3,117,100	51
Vincennes	347,300	8	—	—	—	—
Total	3,631,414	48	3,117,100	51	3,117,100	51
IOWA						
Ames	16,799,125	325	16,888,900	325	17,023,900	327
Ankeny	645,816	10	558,200	10	558,200	10
Total	17,444,941	335	17,447,100	335	17,582,100	337
KANSAS, Manhattan	4,030,566	68	3,467,700	68	3,917,700	70
KENTUCKY, Lexington	919,881	21	911,300	21	911,300	21

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1985		Estimated 1986		Estimated 1987	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
LOUISIANA						
Baton Rouge	1,372,350	30	1,442,700	30	1,442,700	30
Houma	1,329,701	33	1,333,700	33	1,333,700	33
Lake Charles	308,375	5	—	—	—	—
New Orleans	14,365,909	294	15,918,500	294	16,683,500	297
Total	17,376,335	362	18,694,900	357	19,459,900	360
MAINE, Orono	378,900	7	450,000	7	450,000	7
MARYLAND						
Beltsville	67,173,498	1,444	69,818,200	1,440	71,026,000	1,447
Frederick	1,984,684	34	1,973,000	34	1,973,000	34
Hyattsville	345,419	11	401,900	11	401,900	11
Total	69,503,601	1,489	72,193,100	1,485	73,400,900	1,492
MASSACHUSETTS						
Boston	10,859,099	4	11,664,900	4	11,664,900	4
Otis AFB	247,617	2	—	—	--	--
Total	11,106,716	6	11,664,900	4	11,664,900	4
MICHIGAN, East Lansing	3,399,061	65	3,144,300	65	3,144,300	65
MINNESOTA						
East Grand Forks	486,881	9	383,000	9	383,000	9
Minneapolis	870,499	6	1,139,800	6	1,139,800	6
Morris	1,817,841	32	1,650,400	32	1,650,400	32
St. Paul	2,804,841	52	2,688,000	52	2,688,000	52
Total	5,980,062	99	5,861,200	99	5,861,200	99
MISSISSIPPI						
Mississippi State	6,053,584	117	5,729,400	117	5,864,400	118
Oxford	2,798,786	66	3,165,000	66	3,165,000	66
Poplarville	392,396	9	378,800	9	378,800	9
Stoneville	8,079,291	170	8,787,300	170	8,967,300	171
Total	17,324,057	362	18,060,500	362	18,375,500	364
MISSOURI, Columbia	4,035,445	85	3,960,500	85	4,095,500	86
MONTANA						
Bozeman	1,050,123	20	977,200	20	977,200	20
Miles City	1,703,387	12	1,584,300	12	1,584,300	12
Sidney	383,384	7	437,300	7	437,300	7
Total	3,136,894	39	2,998,800	39	2,998,800	39

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1985		Estimated 1986		Estimated 1987	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
NEBRASKA						
Clay Center	7,858,789	53	7,728,600	53	7,953,600	54
Lincoln	2,846,510	41	2,712,800	41	2,712,800	41
Total	10,705,299	94	10,441,400	94	10,666,400	95
NEVADA, Reno	653,091	12	620,000	12	620,000	12
NEW JERSEY						
New Brunswick	498,528	10	487,500	10	487,500	10
NEW MEXICO						
Las Cruces	1,173,534	31	1,246,300	31	1,246,300	31
NEW YORK						
Geneva	491,770	6	581,400	6	581,400	6
Ithaca	3,070,492	30	2,946,800	30	2,946,800	30
Plum Island	9,564,302	247	8,800,800	247	8,800,800	247
Total	13,126,564	283	12,329,000	283	12,329,000	283
NORTH CAROLINA						
Oxford	2,038,105	31	2,184,700	31	2,184,700	31
Raleigh	4,174,553	64	3,884,300	64	3,884,300	64
Total	6,212,658	95	6,069,000	95	6,069,000	95
NORTH DAKOTA						
Fargo	6,884,288	120	6,773,200	120	6,773,200	120
Grand Forks	5,187,430	26	5,897,300	26	5,897,300	26
Mandan	2,615,253	52	2,334,700	52	2,334,700	52
Total	14,686,971	198	15,005,200	198	15,005,200	198
OHIO						
Columbus	211,586	3	196,000	3	196,000	3
Coshocton	895,542	20	826,300	20	826,300	20
Delaware	589,295	7	569,000	7	569,000	7
Wooster	1,619,075	33	1,517,100	33	1,517,100	33
Total	3,315,498	63	3,108,400	63	3,108,400	63
OKLAHOMA						
Durant	1,854,057	41	1,896,700	41	1,896,700	41
El Reno	1,380,809	30	1,454,700	30	1,454,700	30
Lane	345,293	2	469,200	2	739,200	3
Poteau	331,116	7	562,900	7	562,900	7
Stillwater	1,989,071	32	1,800,200	32	1,800,200	32
Woodward	786,824	15	722,400	15	722,400	15
Total	6,687,170	127	6,906,100	127	7,176,100	128
OREGON						
Burns	223,285	2	212,900	2	212,900	2
Corvallis	2,543,427	42	2,555,100	42	2,555,100	42
Pendleton	963,378	22	959,400	22	959,400	22
Portland	1,272,814	17	959,600	17	959,600	17
Total	5,002,904	83	4,687,000	83	4,687,000	83

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1985		Estimated 1986		Estimated 1987	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
PENNSYLVANIA						
University Park	2,816,457	53	2,687,700	53	2,687,700	53
Wyndmoor	14,463,102	270	14,651,100	270	16,316,100	279
Total	17,279,559	323	17,338,800	323	19,003,800	332
SOUTH CAROLINA						
Charleston	1,841,389	42	1,875,400	42	2,235,400	44
Clemson	1,375,230	27	1,741,700	27	1,741,700	27
Florence	1,780,903	41	1,685,800	41	1,685,800	41
Total	4,997,522	110	5,302,900	110	5,662,900	112
SOUTH DAKOTA						
Brookings-Madison	1,658,454	35	1,527,800	35	1,527,800	35
TENNESSEE						
Greenville	52,583	1	51,400	1	51,400	1
Jackson	129,122	3	130,900	3	130,900	3
Knoxville	374,021	7	- -	—	- -	—
Lewisburg	163,635	3	147,500	3	147,500	3
Total	719,361	14	329,800	7	329,800	7
TEXAS						
Beaumont	778,146	16	766,500	16	766,500	16
Brownwood	551,955	12	614,900	12	614,900	12
Bushland	2,336,183	39	2,187,100	39	2,187,100	39
College Station	7,486,610	133	7,789,900	133	7,924,900	134
Houston	3,212,428	5	4,106,100	5	4,106,100	5
Kerrville	2,661,237	55	2,353,200	55	2,353,200	55
Lubbock	2,014,891	35	2,214,600	35	2,214,600	35
Temple	2,695,967	51	2,732,400	51	2,732,400	51
Weslaco	5,374,251	118	5,346,600	118	5,616,600	119
Total	27,111,668	464	28,111,300	464	28,516,300	466
UTAH, Logan	2,917,682	53	2,897,400	53	2,897,400	53
VIRGINIA						
Richmond	148,432	2	- -	—	- -	—
Suffolk (Holland)	502,744	12	483,300	12	483,300	12
Total	651,176	14	483,300	12	483,300	12
WASHINGTON						
Prosser	1,963,816	39	2,166,900	39	2,301,900	40
Pullman	4,751,016	79	4,818,300	79	4,818,300	79
Wenatchee	981,317	20	1,059,200	20	1,059,200	20
Yakima	2,504,270	52	2,414,200	52	2,414,200	52
Total	10,200,419	190	10,458,600	190	10,593,600	191

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1985		Estimated 1986		Estimated 1987	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
WEST VIRGINIA						
Beckley	2,136,655	20	2,074,900	20	2,074,900	20
Kearneysville	2,914,616	24	3,203,900	24	3,203,900	24
Total	5,051,271	44	5,278,800	44	5,278,800	44
WISCONSIN, Madison	4,015,348	45	4,803,900	45	4,803,900	45
WYOMING						
Cheyenne	478,940	13	670,900	13	670,900	13
Laramie	1,040,536	49	1,961,900	54	1,961,900	54
Total	1,519,476	62	2,632,800	67	2,632,800	67
PUERTO RICO						
Mayaguez	1,332,631	34	1,902,100	41	1,902,100	41
Río Piedras (San Juan)	346,309	7	--	--	--	--
Total	1,678,940	41	1,902,100	41	1,902,100	41
VIRGIN ISLANDS						
St. Croix	224,803	6	220,500	6	220,500	6
OTHER COUNTRIES						
Argentina, Buenos Aires	218,564	1	217,400	1	217,400	1
France, Behoust	749,292	2	750,300	2	750,300	2
Italy, Rome	459,669	2	516,400	2	516,400	2
Kenya, Mugaga	129,875	2	142,000	2	142,000	2
Korea, Seoul	124,879	3	125,100	3	125,100	3
Mexico, Tuxtla Gutierrez	1,025,669	9	924,600	9	924,600	9
Netherlands, Rotterdam	329,770	2	314,200	2	314,200	2
Thailand, Chiang Mai	197,329	1	154,800	1	154,800	1
Guatemala, Guatemala City	132,647	1	133,000	1	133,000	1
Total	3,367,694	23	3,277,800	23	3,277,800	23

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1985		Estimated 1986		Estimated 1987	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
Extramural and Program locations to be determined.....	6,274,264	- -	15,197,600	- -	17,446,800	- -
Contingency Research Fund.....	a/	- -	994,000	- -	994,000	- -
Repair & Maintenance of Facilities.....	10,236,000	- -	11,026,000	- -	11,026,000	- -
Unobligated Balance.....	3,438,110	- -	- -	- -	- -	- -
Subtotal, Available or Estimate.....	489,484,643	8,170	499,175,000	8,158	512,667,000	8,218
Allotment to Forest Service.....	355,357	- -	386,000	- -	386,000	- -
Transfer to CSRS.....	7,800,000	- -	- -	- -	- -	- -
Transfer to Departmental Administration.....	159,000	- -	159,000	- -	- -	- -
Transfer to ERS.....	107,000	- -	- -	- -	- -	- -
Transfer to Departmental Administration and Office of Governmental and Public Affairs.....	- -	- -	305,000	- -	- -	- -
TOTAL, Appropriation.....	497,906,000	8,170	500,025,000	8,158	513,053,000	8,218

a/ Obligations for the $1,000,000 appropriated in 1985 are included in the locations above.

AGRICULTURAL RESEARCH SERVICE

STATUS OF PROGRAM

Agricultural Research Service (ARS) conducts mission-oriented research to perpetually ensure an abundance of high-quality, nutritious, reasonably priced food and other agricultural products to meet domestic and world needs while maintaining environmental quality. ARS uses coordinated, interdisciplinary approaches to conduct basic and applied research pertaining to research on soil and water conservation, plant productivity, animal productivity, commodity conversion delivery, human nutrition, and integration of agricultural systems.

Research is conducted at numerous locations in the United States, Puerto Rico, Virgin Islands, and several foreign countries. When appropriate, the research is conducted in cooperation with the State agricultural experiment stations, other State and Federal agencies, and private institutions.

RESEARCH ON SOIL AND WATER CONSERVATION

Current Activities: Strategies and technologies for managing the resource base are being developed that not only can be profitably adopted by agricultural producers but also promote conservation of the quality and production capacity of the Nation's soil, water, and air resources for future generations. The research program stresses the development of management systems that can be used by farmers, extension specialists, and agri-industry to make decisions that maintain farm profitability while minimizing adverse impacts on long-term productivity and on the environment. Investigations include research aimed at reducing salt damage to soils, crops, and water; improving the efficiency of irrigation and drainage of agricultural lands; developing tillage practices for reducing soil erosion and for improving soil properties and crop growth; making more effective use of precipitation and solar energy for crop production; conserving and enhancing soil fertility and the nutritional quality of plants and animals; preventing pollution of and improving the quality of soil, water, and air; controlling erosion by water and wind; and conserving and managing agricultural water resources.

Selected examples of recent progress:

Soil bacterium metabolizes carbofuran in a matter of hours. There is increasing evidence that in some soils, soil micro-organisms are capable of destroying soil-applied pesticides before effective control of the pest has been achieved. Difficulties experienced in isolating the causative organisms have slowed progress on the development of techniques for identifying these problem soils. ARS scientists have now successfully isolated a very active soil bacterium that can destroy carbofuran in a matter of hours. Because carbofuran is one of the major soil-applied insecticides used for corn rootworm control, this breakthrough should lead to more efficient pesticide use in corn-producing areas of the country.

Ultraviolet irradiation and ozonization facilitate pesticide waste disposal. A major problem faced by the American farmer and commercial pesticide applicators is the safe and effective disposal of pesticide wastes. ARS scientists have been working on a new approach to pesticide waste disposal involving the use of ultraviolet irradiation and ozone to break up the pesticide molecule so that it can be easily metabolized by soil micro-organisms. This new disposal technology has been successfully tested on several widely used pesticides, such as 2,4-D, atrazine, and paraquat.

Tiled infiltration bed reduces streamflow contamination by feedlot runoff. In the eastern United States, cattle managed in groups of 100 head or fewer, are fed in confinement at various times of the year in small or unpaved lots. Runoff water from these lots transports animal wastes and other pollutants into downstream waters. ARS scientists designed a system for measuring the amount and quality of runoff from small feedlots and showed that water quality was improved when the runoff was forced through a shallow settling basin and into a tile-drained infiltration bed. This work defined the kinds of pollutants that result from small feedlot operations and will provide action agencies with valuable technology for controlling the quality of small feedlot runoff.

Within-row irrigation substantially reduces amount of water applied in dry bean production. Conventional furrow irrigation for dry bean production frequently wastes water and causes severe soil erosion in highly erodible silt loam soils. By irrigating only long enough for the water to reach the end of the furrow and then planting the bean seed in the bottom of the furrow, the quantity of water applied for preplanting irrigation was reduced by 60 percent. Furthermore, by limiting irrigation to the furrows where the beans were planted, total water applied was reduced by 42 percent. Dry bean yields were the same for conventional and within-row methods of irrigation.

Interseeding of rye in Coastal bermudagrass increases nitrogen recovery from broiler litter applications. The Southern Piedmont has a climate that permits the growth of both warm and cool season grasses in partly overlapping seasons. It is also a region with a large poultry industry and a poultry waste disposal problem. In lands planted to Coastal bermudagrass and receiving high rates of broiler litter applications, interseeding the bermudagrass with annual rye increased the yields of high quality forage by 32 to 35 percent, while reducing N losses from those lands. High rates of broiler litter application per unit of land reduce waste disposal costs for the poultry industry.

Ambient ozone concentrations reduce cotton yields. Ozone reduces the yields of cotton grown in California by about 15 percent each year. To determine whether yields of cotton grown in the South are also reduced by ozone, field-grown cotton was exposed to ozone concentrations which occur in the South. Ambient concentrations of ozone at an experimental site near Raleigh, NC, decreased lint and seed yields of 'Stoneville-213' cotton by 11 percent. Relationships were developed to estimate cotton yield losses for any concentration of ozone likely to occur where cotton is grown. These relationships will be used by the Environmental Protection Agency to set air quality standards that protect agricultural interests.

Model to predict water and sediment yields from rural basins validated. SWRRB (Simulator for Water Resources in Rural Basins), a model developed to predict the impact of alternative management decisions on water and sediment yields, has been validated. Experiments on 11 large watersheds from 8 locations across the nation showed that the model can realistically simulate water and sediment yields under a wide range of soils, climates, land uses, topographies, and management alternatives. The validation will give consultants, government agencies, and others who are currently using the model greater confidence in the results they obtain.

Thickspike wheatgrass and fourwing saltbush return strip-mine spoils to productive land. Strip-mine spoils can be returned to productive land by revegetating them with two forages -- thickspike wheatgrass and fourwing saltbush. Both grasses have passed preliminary tests by germinating well in salt solutions similar to those of soils and mining spoils in the northern Great Plains. Also, fourwing saltbush, a native shrub which grows on millions of acres extending from the western Dakotas and Kansas to eastern Oregon and Washington, was found to fill a very important void in cattle diets by providing them with more protein, phosphorus, and carotene than most range grasses, especially in winter.

Banded applications of the nitrification inhibitor, dicyanodiamide, reduce the growth of corn and sorghum plants. Previous research has shown that use of the nitrification inhibitor, dicyanodiamide, or DCD, can improve fertilizer nitrogen efficiency and crop yields. To date, only limited attention has been given to evaluating DCD toxicity on crop growth and yield. ARS research on the toxicity of DCD to corn and grain sorghum showed that sorghum is more sensitive than corn, and that broadcast applications of DCD reduce plant growth minimally. However, banded applications of fertilizer containing DCD were found to be highly toxic to corn and sorghum. Farmers who use nitrogen fertilizers containing DCD in banded applications risk yield reductions from DCD toxicity.

Injections of soil amendments alleviate adverse effects of subsoil acidity on crop production. Subsoil compaction occurs readily in the sandy soils of the Southeast. Deep tillage is an effective treatment, but requires energy, is time consuming, and must be repeated each year. A new tillage system, slit-till, which cuts vertical slits through the plowpan to promote root growth in the subsoil, uses 12 to 43 percent less energy than conventional subsoiling. The slit-till system was modified to enable injection of chemical amendments into an acid subsoil layer. The improvement in plant growth resulting from the injection of chemical amendments demonstrates the potential for reducing subsoil acidity and improving crop production on nearly a million acres of cropland in the Coastal Plains.

Software developed to integrate water and energy management for center pivot irrigation systems. Increasing energy costs and declining groundwater levels have increased irrigation costs. ARS scientists have developed an integrated water and energy management software program to reduce center-pivot irrigation costs and to improve water management. The user-friendly software program enables farmers to schedule irrigations and to remotely operate center-pivot systems. Tests of this management system showed that by scheduling irrigations to more closely match crop water requirements energy costs could be reduced approximately $900 per year per center-pivot system. Similar management systems are now being developed commercially and will be available to farmers irrigating 15 million acres of land with thousands of center-pivot systems.

Sawmill wastes and nitrogen fertilizer promote revegetation of bentonite mine spoils. The mining of bentonite in the northern Great Plains has produced extensive areas of unvegetated spoils ranging from 20,000 to 30,000 acres in Wyoming and similarly extensive areas in Montana and South Dakota. ARS research has shown that the incorporation of sawmill wastes (wood chips, sawdust, bark), and nitrogen fertilizer amendments into these spoils promotes the establishment of perennial grasses and the production of forage for livestock grazing while utilizing byproducts of the sawmill industry. Based on this work, 6,000 acres of abandoned bentonite lands in Wyoming have recently been scheduled for reclamation.

ARS designed structures will be used for the Yazoo Basin project. ARS is cooperating with the Soil Conservation Service and the U.S. Army Corps of Engineers in the development of a watershed protection program for the Yazoo Basin in Mississippi. The six watersheds selected for demonstrating the effectiveness of flood and sediment control measures in the Yazoo Basin are to be equipped with hydraulic structures designed by ARS. Use of these structures is expected to reduce the cost of channel grade control by 50 to 60 percent.

Conservation tillage system developed for high-clay soils. Special procedures and field equipment are required for the profitable no-till cropping of high-clay soils. An experimental no-tillage system has been developed for use on Texas Blackland Prairie soils which uses raised wide cropping beds, controlled traffic, and a three-crop rotation of grain sorghum, cotton, and wheat. Economic analyses predict a slightly higher profit margin for farms where no-tillage is used in place of conventional tillage.

RESEARCH ON PLANT PRODUCTIVITY

Current Activities: Emphasis is on reducing the relative costs of producing crop commodities and improving quality to meet consumer needs and to maintain competitiveness in world markets. Special attention is being given to the collection, preservation, evaluation, and enhancement of our plant genetic resources. These plant germplasm collections provide the base for improved varieties that are resistant to disease and insect pests and more tolerant to drought, temperature extremes, and other stress factors. New technologies are being developed to control pests while avoiding contamination of our soil, air, and water resources. Plant growth models are being tested under "on-farm" conditions to aid growers in making management decisions which will reduce production costs and improve marketability of crop commodities.

Selected Examples of Recent Progress

Primitive peanut germplasm and nitrogen-fixing rhizobium collected in Peru. Primitive land races of peanuts, some of which are descendants of the earliest peanuts cultivated by man, were collected from the coastal areas of Peru. These late-maturing, primitive forms possess useful genes for drought and heat tolerance and add to our basic resources for improving our current peanut varieties. Some associated species of nitrogen-fixing bacteria growing on the peanuts were also collected and will be evaluated for their efficiency in fixing nitrogen.

Alfalfa germplasm with multiple pest resistance released. Estimated annual losses in alfalfa from disease and insect pests amount to about 40 percent of national production. Alfalfa germplasm was released for use by breeders that provides protection against five major diseases (anthracnose, bacterial wilt, downy mildew, Fusarium wilt, and Phytophthora root rot) and two insects (pea aphid and spotted alfalfa aphid). This new alfalfa population was derived from 75 diverse sources and illustrates the importance of collecting and preserving our germplasm resources.

Genetic base for hybrid sunflowers broadened. Sunflower hybrids are currently being produced from a single source of cytoplasmic male sterility for seed production purposes. The use of this single source limits the genetic base of parental lines and increases the vulnerability of the entire U.S. sunflower crop to diseases. Three new and different germplasm sources for male sterility have been developed for use in producing broader based sunflower hybrids for the future.

Improvements in sugarcane possible because of new pollen storage technique. Pollen of sugarcane and its related genera has been successfully frozen (by a drying and ultra cold freezing technique) so that it will remain viable for more than 50 days. Many important interspecific and intergeneric crosses which have previously been extremely difficult to produce, because of different flowering dates, will now be possible. This will accelerate the development of new and improved sugarcane germplasm.

New information may lead to more cold-tolerant citrus varieties. Fatty acids in the leaves of a cold-hardened citrus hybrid were similar to those in a hardy species and different from those in a less hardy species. Specific results suggest that triacylglycerol has a role in maintaining the fluidity of biomembranes during freezing conditions. This information may ultimately help plant breeders and geneticists to develop more cold-tolerant citrus varieties.

New understanding of how plants synthesize oil may lead to increased soybean oil production. Structures called "plastids", within the cells of soybean seed, have been shown to form oil. This finding is of special importance because it indicates that the mechanism for oil formation in plants is different from that in animals. Finding the location of the enzymes (proteins) that govern oil synthesis enhances the likelihood of increasing soybean oil production through plant breeding.

Chloroplast DNA analysis procedure developed for cotton. A procedure was developed for obtaining purified chloroplast DNA from cotton leaf tissue and analyzing the DNA by use of restriction endonucleases. DNA analyses are an important first step in the development of sophisticated genetic engineering techniques for cotton.

Peach plants regenerated successfully from callus derived from immature embryos. Tissue culture and genetic engineering techniques are now available to facilitate breeding improved peach trees with disease and pest resistance. These techniques cannot be fully utilized, though, unless plants can be regenerated from callus. A detailed procedure has now been described for regenerating peach plants from callus derived from immature embryos.

Automated plant culture system developed. A computer-aided apparatus was constructed that can be used to grow plant tissues and whole plantlets under sterile conditions. Growth of the plants equalled or exceeded that occurring in the highly labor-intensive manual system currently employed. This development appears to have direct application in the commercial propagation of plants.

Cotton germplasm developed with improved fiber quality. ARS scientists in South Carolina and Mississippi have developed improved germplasm that combines increased fiber staple length and tensile strength with premium range micronaire values and acceptable yields. Improved cotton quality is essential for U.S. growers to maintain competitiveness in the world's fiber markets.

High protein soybean lines developed. Six breeding lines of soybeans have been developed with 48 to 50 percent protein in the seed. Unfortunately, they are lower yielding than the current commercial soybean varieties which average 40 to 43 percent seed protein. This germplasm is being distributed to public and private soybean breeders to explore the potential for developing new varieties with both high protein and acceptable yield.

Near infrared reflectance spectroscopy useful for analyzing quality farm-grown alfalfa. Near infrared reflectance spectroscopy (NIRS) has been used to accurately analyze crude protein, acid detergent fiber, and neutral detergent fiber of farm-grown alfalfa. This technological advance allows fast, accurate, and nondestructive analyses of very small samples of forage. The NIRS method of analysis can be utilized by operators of animal feed quality testing laboratories and extension specialists to promote use of improved quality forages and can lead to improved live performance.

Root rots that kill orchard trees can be controlled. The most serious diseases of irrigated cherry and nut orchard crops in California are crown and root rots that kill the trees. The problem is associated with wet soils caused by improper irrigation practices. Research has shown that these diseases can be avoided by adoption of a specific irrigation regime which does not allow the soil to become saturated for more than 4 hours every 2 weeks.

Technology developed to apply beneficial fungi to fields to control plant root diseases. Several naturally occurring beneficial fungi have been discovered and shown to be effective in controlling serious root rotting diseases of cotton, potatoes, and lettuce in experimental systems. But, until recently, there was no acceptable method to introduce these useful fungi back into fields on a commercial scale and maintain their viability. Scientists have now developed a carrier for these fungi in the form of dried sodium calcium pellets which are easily handled and compatible with agricultural equipment while maintaining effectiveness of the fungi for over 3 months.

Cause of sugarcane disease discovered. Ratoon stunting is one of the most damaging diseases of sugarcane throughout the world. In spite of years of research, its cause has remained a mystery and control was difficult. Recently ARS scientists discovered that an unusual form of bacterium was responsible. Coupled with this discovery, ARS developed the technology to detect this highly infectious pathogen in sugarcane "seed" stocks. Today the industry in the U.S. is the beneficiary of this technology in that certified ratoon-stunting disease-free cultivars are now available to growers.

Rust disease of beans can be controlled with a natural substance from bacteria. Rust disease of beans is a serious problem throughout the eastern United States. In commercial production areas along the Atlantic Coast, control has been possible only by weekly application of chemical sprays. A new method of control is on the horizon which involves spraying beans with the product of a naturally occurring, harmless bacterium. Experiments with this new biological material have given up to 70 percent control of all strains of the rust fungus without use of manufactured chemicals.

Chemical attractants can be used to keep yellow jackets (both a friend and a foe) in their place. An artificially prepared pheromone which attracts a predaceous insect, the stink bug, has also been found to attract yellow jackets. While yellow jackets are highly beneficial predators they are also a severe nuisance in areas of human activity. The development of this pheromone will facilitate the selective control of yellow jackets.

Boll weevil eradication in the southeastern United States. Technology using pheromones for surveillance and detection, combined with the use of sterile insects and the judicious use of insecticides, is eradicating the cotton boll weevil in North and South Carolina. An intensive pheromone trapping system in the weevil-free area gives constant surveillance against reinfestation.

Weed control with natural plant chemicals. Sunflowers, black walnuts, and sorghum are among the many plants that produce chemicals from their root systems that inhibit the growth of other plants including weeds. Recent laboratory tests have shown that populations of such serious weed pests as velvetleaf, pigweed, and lambquarters decline sharply when planted alongside germinating sorghum. Current research is looking at ways to synthesize these chemicals to produce herbicides that can be used without risk to the environment.

Computer-aided management systems developed for cotton growers. A team of specialists in Mississippi and South Carolina is conducting preliminary tests of a computer-simulation model developed by ARS and designed to assist cotton farmers in making crop management decisions. The program analyzes a variety of crop and weather information and aids growers in making various management decisions including the proper timing for applying fertilizers, pesticides, and harvest aid chemicals. A recent survey shows that 22 percent of cotton producers now have computer systems and that another 10 percent intend to acquire them during this year.

Bioregulator increases utilization of photosynthetic carbon. The plant bioregulator DCPTA increases the biomass and/or compositional quality of crops such as cotton, soybeans, alfalfa, bushbeans, guayule, and lemon. More recent work now indicates that DCPTA acts by increasing the flow and utilization of photosynthetic carbon by the plant. This is the first bioregulator with a broad spectrum of activity which directs more photosynthates into economically useful parts of the plant. The increased productivity per unit of input will benefit producers of many major commodities.

Citrus juice vesicles successfully cultured. Successful early growth and development in vitro of citrus fruit juice vesicles has been achieved for the first time in a microcomputer-controlled, automated plant-culture system. The automated system is being developed to maintain the rigorous conditions required for prolonged culture of juice vesicles and other fruit organs in studies to find the control mechanisms of fruit development. We can now study the development of the compounds that give the juice desirable or undesirable characteristics and improve fruit and juice quality and yield. Producers can benefit through development of improved citrus strains that more closely meet the market needs.

RESEARCH ON ANIMAL PRODUCTIVITY

Current activities: Emphasis is on reducing the incidence of disease, improving the efficiency of production of livestock and poultry, and improving the quality of animal products that are used in human diets. New technology is needed to reduce the incidence of diseases on farms and increase production efficiency, while providing a high-quality and safe supply of animal products for domestic and export markets. The areas of research are designed to solve short- and long-term national problems. Current research efforts to meet high-priority needs include research on control of pseudorabies, brucellosis, Johne's disease, leptospirosis, bluetongue, avian influenza, and arthropod vectors of disease; technology to prevent introduction of foreign diseases of livestock and poultry; factors that influence reproductive efficiency; study of pathology, toxicology, physiology, nutrition, genetics, and management; and decreasing the fat content of meat through manipulating the cellular processes that control protein and fat synthesis.

Selected examples of recent progress:

New genetic engineering approach holds promise to improve performance and reduce disease incidence in farm animals. For the first time, an identical copy of a gene from one species has been inserted into the fertilized egg of a food-producing animal of another species and found to function. The gene is a replica of one found in humans and controls growth hormone. It was injected into fertilized pigs' eggs and proved active in a small percentage of these animals. This new technology provides new knowledge and a potential opportunity to take advantage of genetic resistance to disease and improve production efficiency in animals.

Sexual performance of boars can be improved by using newly developed test. Poor sexual performance in male pigs is a major problem to pork producers. ARS scientists utilized biochemical tests and devised evaluation schemes to predict sexual drive in boars so that unfit ones go to market instead of consuming expensive feed without ever siring piglets. Hormone levels in unborn, growing, and adult males may provide clues as to why up to 25 percent of males selected as breeding stock turn out to be sexually inadequate. Penning arrangements with at least three boars per pen also improved sexual performance.

Selection for twinning can be used to increase calf crop in beef cattle. In a selected group of cows, a live calf crop of 105 percent was realized from 129 females that were 3 years old or older. Twinning rate was 10 percent for cows selected from dams producing three or more sets of twins. This means that twinning rate can be increased by selection. Since two-thirds of the feed cost for beef production is maintenance cost of the reproducing animals, the increase in calf crop through selection for twinning cows could significantly reduce production cost.

Experimental bluetongue virus vaccine developed. Bluetongue virus was killed with controlled irradiation, and the killed virus was found to be protective against the disease when given to sheep in two sequential doses. The application of this product could lead to successful programs for controlling and eradicating this virus infection of sheep, cattle, and zoological ruminants.

New, potentially dangerous parasite of sheep identified for first time in North America. The parasite, Nematodirus battus, was recovered from the small intestine of sheep born and raised in the Willamette Valley of western Oregon. Previously, this nematode was believed to have a geographic distribution limited to the British Isles and a small area in Europe, where it is recognized as a significant pathogen in lambs. Information useful for identifying the nematode has been provided, and Animal and Plant Health Inspection Service, ARS, and State scientists are investigating the potential threat to the sheep industry.

New genetic techniques for introducing lethal genes into mosquitoes developed. New genetic research techniques have been developed for introducing six recessive, lethal, mutant genes into a mosquito population. Application of these techniques would result in the loss of the mosquito's ability to reproduce itself and, thus, has great potential for controlling mosquitoes and reducing the transmission of certain diseases of humans and livestock.

Genetically engineered antigen could become a key to developing a vaccine against an intestinal disease of poultry that cost the industry $300 million a year. ARS scientists, using genetic engineering techniques, are the first scientists to have produced by artificial means an antigen that protects against a species of coccidia. ARS scientists are now working with Genex Corporation to turn the antigen into a vaccine for the poultry industry. The development of this antigen is an important milestone toward controlling poultry coccidiosis nonchemically and provides techniques applicable to antigen production for other species of coccidia.

Vaccine reduces shipping fever losses. Beef producers suffer heavy losses each year due to shipping fever (pneumonia) in beef cattle. Disease losses occur particularly in cattle 3 to 9 months of age. An active vaccine was developed against one serotype of Pasteurella haemolytica (P.h.), which causes the disease. After further refinement, this vaccine may lead to the development of an effective commercial vaccine against shipping fever.

New blood test developed to diagnose progressive pneumonia in sheep. A new blood test for diagnosing progressive pneumonia, a viral disease that affects U.S. sheep, can help ranchers select breeder sheep resistant to the disease. The disease is fatal once the sheep become sick; however, only a low percentage of the sheep actually show signs of the disease, such as weight loss, difficult breathing, and listlessness. Tests showed that Columbia sheep were more resistant to the virus than Border Leicester sheep.

New method to prevent milk fever of dairy cattle developed. Milk fever, a disease of dairy cows that occurs shortly after calving, is characterized by low blood calcium and paralysis and results in at least $150 million in losses each year to dairy farmers. It was discovered that intravenous infusion of a small amount of synthetic hormone (bovine parathyroid hormone), given to the cow a few days before and after calving, effectively prevented the disease. Once economical commercial methods are developed to produce the hormone in large amounts and a slow release injectable form of the hormone is made, the use of the hormone together with good nutritional management may significantly reduce losses due to milk fever.

Cattle can be lifetime carriers of bovine viral diarrhea (BVD). BVD is one of the viruses that infects the gastrointestinal tract of cattle. BVD infects about 80 percent of all cattle before they reach 1 year of age and causes more economic loss than any other cattle virus. About 1 percent of cattle were found to be lifelong carriers of BVD virus and able to spread it to other cattle. This discovery explains the mystery of how this important disease is spread. A simple diagnostic test is needed to identify these BVD carriers so that they may be removed from herds and prevented from spreading the virus.

Avian influenza virus isolated from eggs. For the first time, avian influenza virus has been isolated from the internal contents of eggs laid by naturally infected chickens. The virus was recovered from the yolk, albumen, and shell surface of eggs obtained from chicken flocks in Pennsylvania and Virginia. These recoveries provide essential information required to prevent spread of the virus associated with commercial movement of table and hatching eggs.

Vaccination of eggs prior to hatching can prevent infectious bronchitis. Infectious bronchitis virus causes a highly contagious respiratory disease in chickens and must be controlled by vaccination if severe losses are to be avoided. At present, vaccination is administered after the chicks hatch. When administered to eggs, the vaccine protected the hatched chicks

against the disease. This embyro vaccination technique, applied to many different viruses, could substantially decrease the cost of vaccination to the poultry industry.

Oral vaccination prevents diarrhea in young pigs. Oral vaccination was used to protect nursing piglets against diarrheal disease caused by Escherichia coli, a common cause of bacterial diarrhea and death of young pigs. It was found that oral vaccination of the dam given before the first and second lactations stimulated milk antibody and protected pigs during the first and second lactations. Current vaccination procedures protect the pig for only the first few days after birth.

New technique developed to determine how antibodies combat disease in cattle. Normal white blood cells from cattle have been successfully fused with mouse cells to produce a hybrid cell that produces cow antibodies. The hybrid cell in culture produces pure bovine antibodies similar to those that protect cows against disease. The ability to produce large quantities of these pure antibodies in culture will allow scientists to determine how antibodies function, as well as to improve methods for protecting animals against disease.

New method developed that improves forage quality. Chemical conditioning is a new technology that speeds the drying of forages during harvest. Methods for chemically conditioning alfalfa have been specifically adapted to make them practical and economical for the conditions of harvesting used in the United States. One of these adaptations is the use of controlled droplet application, which greatly reduces the amount of chemicals required for rapid drying. The use of this new technology may reduce some of the large losses that occur in haymaking and increase the quantity and quality of this major crop.

RESEARCH ON COMMODITY CONVERSION AND DELIVERY

Current Activities:. The current post-harvest science and technology program is targeted to vital, problem-oriented research that contributes to the value of agricultural commodities and, therefore, the economic viability of the farmer. Research is directed to converting major commodities to new uses of value-added products which can expand export markets and thus support the important role of agriculture in the balance of payments for the United States. The primary objectives of the program are to develop products for new consumer and industrial markets; to increase the quality of agricultural commodities and materials; to reduce losses caused by pests, spoilage, and physical and environmental damage; to ensure the safety of agricultural products and workers; and to increase the opportunity for export of value-added products and eliminate impediments to commodity export.

Selected exanples of recent progress:

Duration of stress period conducive to aflatoxin contamination of peanuts. To establish the duration of conditions necessary for aflatoxin contamination, peanut plants were exposed to stress conditions for various time periods prior to harvest. A stress period of 30 days or more before harvest resulted in aflatoxin contamination of edible peanuts by Aspergillus flavus, but, those exposed for 20 days were not affected. This knowledge will enable peanut growers to predict when their peanuts will be contaminated and thus take preventive measures (irrigation) against product contamination and losses.

New tool to increase quality and value of soybeans. A limitation in applying biotechnology and genetic engineering to improving the quality of agronomically important crops is the difficulty of identifying and isolating of genes controlling plant traits. Transposable elements are units of DNA which are capable of changing their positions in the chromosomes of the plant. In soybeans, the complete structure of a DNA element which causes a mutation in the activity of a seed protein gene has been determined. It resembles transposable elements in corn in several key features. Using the soybean element as a probe may allow investigators to identify genes which control traits of importance to the farmer and processor.

DNA sequence of gene coding determined for flour quality proteins in wheat. A gene coding for alpha-gliadin, one of the major flour-quality-determining proteins of wheat, has been cloned, and its DNA sequence determined. The availability of this gene in pure form and use of the information contained in its DNA sequence are the first steps in developing means to improve the baking quality of wheat.

Timely harvesting of fruit can decrease fungal rot. Studies of host-parasite environment interactions led to the finding that cool temperatures in the orchard and high glucose in the fruit often allow fungal spores to double their rot-causing ability on the harvested fruit. These studies correlated agronomic practice with later deterioration. Farmers can now take effective measures during harvesting to prevent postharvest rot and decrease crop losses.

New ginning process improves cotton fiber quality and reduces costs. A radically new, simplified ginning and cleaning process has undergone successful pilot evaluation. The new design combines a gin stand with two lint cleaners into a single unit, and would replace the air transport machinery currently used. The new design should cut energy requirements in ginning 40 to 50 percent, improve quality of the cotton fiber, and reduce space, capital and operating costs in new gin installations.

Cotton fiber made without a plant. A way to generate cotton fiber by tissue culture, independent of the plant, has been found. The significance of this development lies in its application to the improvement of cotton quality. When suspended in a nutrient solution, hypocotyl cells differentiate to form cotton fibers. A full understanding of the gene chemistry involved should lead to ways for improving the genetics of cotton plants so that they produce longer and stronger fibers.

Immobilized lipase found effective for fat-splitting of tallow. The high-temperature fat-splitting of tallow to produce important fatty chemicals is an energy-intensive process which also destroys some natural qualities of the original fat. A class of enzymes called lipases allow fat-splitting to be carried out at low temperatures, so energy costs are reduced and the natural quality is retained. A membrane reactor containing lipase to continuously split tallow was developed. This first use of an immobilized bioreactor for splitting fats is a milestone toward adoption of this technology by the billion-dollar-a-year fatty-acid industry.

Potato flake food processing simulator developed. Optimizing complex food processing operations to minimize loss or consumption of raw materials, nutrients and energy requires a mathematically based systems approach. For the potato flake process, methodology based on this approach has been developed to the point where an interactive computer simulation program performs the required analysis for any conceivable set of food processing operations. This food processing simulator allows process adjustments for the specific properties of incoming materials and can thus benefit potato processors using more variable incoming products.

Formaldehyde-free resin developed for durable press cotton and polyester-cotton fabrics. For several years we have sought a substitute for formaldehyde-containing resins for fabric treatment. When properly manipulated with the right additive and catalysts, glyoxal forms the basis of a resin system which functions as well as formaldehyde-based resins in treating both cotton and blend fabrics. The products have satisfactory performance. The process has been licensed to two major suppliers of formaldehyde-based durable-press resins for use should current resins come under attack or be banned.

Methyl bromide successfully substituted for ethylene dibromide in quarantine treatment of grapefruit. Methyl bromide has been used effectively as a substitute for ethylene dibromide in quarantine treatment of grapefruit. Methyl bromide was used last season to treat Florida grapefruit shipped to California and is expected to be authorized for treating grapefruit exports to Japan in quarantine treatment of the Caribbean fruit fly. Development of this treatment will benefit U.S. citrus producers by allowing uninterrupted shipment and export of fruit.

Galactose identified as softening factor in tomatoes. Softening is a primary factor for the 25 percent loss of all harvested fresh produce, and we do not know how fruit softening is regulated. Studies with tomato fruit showed that of all the monosaccharides hydrolyzed from the cell wall prior to softening, only free galactose accumulated. Free galactose injected into green fruit caused ethylene production and ripening which are associated with softening, whereas water and other monosaccharides had no effect. This knowledge will be useful in developing tomato lines whose softening can be regulated to help reduce the annual $5 billion postharvest losses.

Citrus canker bacteria controlled by chlorine dip. When the citrus canker outbreak occurred in Florida in 1984, we did not know if the shipments of fruit had to be restricted to avoid spread of the disease. Research then showed that they did not survive more than 24 hours on fruit kept at room temperature without any treatment, and that the bacteria were killed immediately when fruit were dipped in 250 ppm chlorine for 2 minutes. These results showed that chlorine-treated fruit can be shipped from a contaminated area without any danger of spreading the bacteria. Thus, uninterrupted shipments and marketing can continue normally.

Fungal protein shown to induce ethylene biosynthesis. A highly purified protein fraction of fungal origin was shown to induce the biosynthesis of ethylene, a ripener hormone, in many plant tissues. Protein in this fraction interacts at the plasmalemma to produce a factor that activates ACC synthase, an enzyme that controls the rate of ethylene biosynthesis. These findings help explain how ethylene biosynthesis is regulated in higher plants and how ethylene is involved in host-pathogen interactions. The fungal protein, a natural bioregulator, will give producers another tool to control ripening.

Cost efficiency improved for controlling stored grain insects with carbon dioxide. Laboratory studies have shown that the exposure time needed to effectively control stored-product insects with carbon dioxide can be dramatically reduced if temperatures of 90 to 100°F are used. These temperatures can be easily obtained in the treatment of truck- or ship-type containers, of food processing machinery, and of harvested feed grains in the fall. This information makes the use of this residue-free treatment potentially more cost effective and, at the same time, less time consuming. This technique, when properly applied, is cost-competitive with conventional fumigants and has the approval of the Environmental Protection Agency.

RESEARCH ON HUMAN NUTRITION

Current Activities: The major USDA program in human nutrition research resides within ARS. It is necessary, however, to carefully coordinate the work of several groups to assure best use of available expertise and resources, as significant nutrition research and evaluation projects are also found in Cooperative State Research Service, Human Nutrition Information Service, Food and Nutrition Service, and Extension Service. Also, nutrition information and education projects are conducted by Human Nutrition Information Service, Food and Nutrition Service, Extension Service, Food Safety and Inspection Service, and Office of Governmental and Public Affairs.

Research effort is being focused on defining required and safe levels of nutrients and other food components for all stages of life. Nutrient needs and tolerances may vary with age, sex, physical activity, genetic differences, and other environmental or host-related factors. Emphasis is placed on the special needs of infants, young children, and the elderly; evaluation of nutritional status; and availability of nutrients from foods.

Selected examples of recent progress:

Fat absorption in premature infants measured by nonradioactive ^{13}C labeled triolein. ^{13}C labeled triolein, a stable isotopically labeled form of fat, can trace fat absorption and oxidation by premature infants and provide information on maturation of the small intestine during the first weeks after birth. This technique is being used to differentiate the roles of human milk and infant formulas in the emulsification, hydrolysis, and absorption of long chain triglycerides. Initial studies showed that premature infants fed their own mothers' milk digested, absorbed, and oxidized triolein to a greater extent than infants fed formulas.

Brans interact with minerals in human diets. Measurements of brans prior to ingestion and after passage through the human gastrointestinal tract revealed significant changes in mineral binding. Wheat bran remnants retrieved from fecal matter contain more calcium than did the starting material; thus, wheat bran appeared to act as a mineral sink to remove calcium from the gastrointestinal tract. This observation is consistent with clinical observations indicating that excessive amounts of wheat bran can cause a negative calcium balance. Drymilled corn bran also was shown to contain significantly more bound calcium, copper, iron, and zinc after ingestion than it contained prior to ingestion.

Dietary calcium related to bone mineral loss in women. A study on the effect of dietary minerals on spine alveolar and radius bone density during aging among 100 healthy postmenopausal women, showed that the quartile of subjects with the lowest dietary calcium intake (less than one-half the RDA) lost significantly more of bone mineral from the spine (7 percent annualized) than did the group as a whole (1 percent annualized). A separate set of studies showed that when taken with a test meal, calcium supplements significantly impaired iron absorption but had no effect on zinc absorption.

Vitamin E stimulates immune response of aged mice. Experiments in animal models have demonstrated that relatively high doses of dietary vitamin E stimulate the immune responsiveness of aged mice to levels that are comparable to those of young mice. This immunostimulatory effect of vitamin E appears to be mediated via decreases in prostaglandin E-2. Furthermore, animals receiving dietary vitamin E supplements had a markedly lower incidence of kidney amyloidosis, a degenerative pathological condition associated with aging. In addition, the dietary requirements for

vitamin E necessary to maintain steady-state levels in the brain were found to increase with age beyond amounts currently recognized as adequate. These findings suggest that the vitamin E needs of the elderly may be greater than recognized at present.

Possible gene marker for coronary artery disease found. Apolipoprotein A-I (APO A-I) is the major protein component of high-density lipoproteins (HDL). Recent work has identified a specific abnormality of the APO A-I gene in approximately 60 percent of subjects with genetic HDL deficiency, 33 percent of patients with premature coronary artery disease, and 4 percent of normal subjects. This gene may prove to be a new marker of great importance in identifying a genetic predisposition to coronary artery disease and may lead to preventive early recommendations for dietary practices/interventions in high-risk individuals.

Vitamin C may protect age-related eye damage. Research studies on the role of nutrition in the etiology of eye lens cataracts have identified age-related damage to eye lens crystallines, specialized proteins in the eye. The protease enzymes which protect crystalline proteins from degradation become less effective during aging and require one or more of the following: magnesium, manganese, and zinc. Enhancing the levels of vitamin C, a dietary antioxidant, has been found to protect against the photo-oxidative damage which accumulates with age. This research approach may lead to dietary recommendations which serve to extend the useful life of the lens and enhance the quality of life of our elderly.

Folate absorption reduced in elderly with atrophic gastritis. Atrophic gastritis, a common asymptomatic condition of the elderly, was found to result in folate malabsorption but not in folate deficiency. Such a deficiency was not indicated because bacterial synthesis of folate in the small intestine was accelerated. The intermittent use of acid-lowering drugs or antacids, which elderly people frequently take with meals, also results in a lowered absorption of dietary folate but is not compensated for by increased bacterial folate synthesis. Furthermore, in elderly people with atrophic gastritis, the use of antibiotics could reduce bacterial snythesis of folate and precipitate a folate deficient state within a relatively short period due to their profound inability to absorb folate.

Soluble dietary fiber (guar gum) improves glucose tolerance. A 6-month long study determined the effect of dietary fiber in the form of guar gum-containing food bars on humans who exhibited adult-onset diabetes. Consumption of the guar bars improved oral glucose tolerance, lowered glycosylated hemoglobin, and allowed increased glucose consumption during the euglycemic clamp (suggesting an increased sensitivity to insulin). Mineral retention was not adversely affected by consumption of the guar bars for the 6-month period. These tasty guar bars were especially developed for this study and are not available commercially. These results thus suggest a potential product for food processors.

Nondestructive technique used for analyzing snack foods. A new, near-infrared reflectance spectroscopy method was used to determine fiber, starch, and total carbohydrate in snack foods and to determine total sugar in breakfast foods. The new technique is rapid and can easily be used in automated procedures for product quality control.

Blood pressure study reveals salt excretion linked to polyunsaturated fat intake. Subjects on a high polyunsaturated fat diet excreted more sodium and potassium in their urine than those on a low polyunsaturated fat diet. In addition, the high polyunsaturated diet seemed to act as a mild diuretic, since it was associated with an increase in volume of urinary excretion. These findings give us a nutrition-oriented approach to lowering high blood pressure. The results came from a 3-month study of eight healthy resident volunteers housed at the Western Human Nutrition Research Center. The subjects were fed carefully controlled diets, and 24-hour urine collections were made for 93 consecutive days.

Folacin requirement determined for the adult female. Limited information exists as to the folacin requirements for humans. Existing information was derived with a synthetic folacin, pteroylmonoglutamic acid (PGA), rather than with naturally occurring forms as consumed in the diet. A study was conducted with 12 healthy nonpregnant female volunteers in the Western Human Nutrition Research Center's Human Nutrition Suite to determine the folacin requirement for women. The results indicated that the minimum folacin requirement of adult women is about 300 mg/day when obtained from dietary sources. The bioavailability of food folacin appears to be less than 50 percent of the bioavailability of PGA.

Dietary lipids affect number of red blood cell insulin receptors. The outer membranes of red blood cells contain receptors, or chemical sites, which bind insulin, a hormone involved in carbohydrate and lipid metabolism. Dietary fats are known to affect the composition of the outer covering of cells and thereby affect their function. In a study of minipigs fed diets containing two different lipids for 6 months, the number of insulin-binding sites was decreased by the diet containing lard (a saturated fat) but was increased by the diet containing cholesterol. When the minipigs were then fed a control diet without these lipids, the changes in insulin binding were reversed. It appears, therefore, that the insulin receptors on red blood cells are in a dynamic state and can be altered by dietary lipids.

Learning and working memory impaired by perinatal zinc deficiency. A study was conducted to determine the effect of the nutritional adequacy of the maternal diet in rats on the performances of their adult progeny. The dams received a diet mildly deficient in zinc (10 ppm) during gestation and lactation. The rat pups were fed a complete diet after weaning to 100 days, then tested on a radial maze for reference (long-term) memory, working memory, and learning. Long-term memory was not impaired, but learning and working memory were significantly impaired. These results show that a nutritional insult during perinatal development in the rat can affect performance in adulthood. Foods rich in zinc include oysters, nuts, beef, turkey, and cheese.

New methods developed for measuring body composition. Total body fat can now be estimated by a quick and easy portable method that uses short wavelengths of infrared light to measure fat at key spots on the body. The method, called IRI for infrared interactions, is faster and more accurate than skin-fold measurements--the most common method used today. A second method involving bioelectrical impedance as an estimator of body composition has been found to give reliable measurements which correlated highly with the same parameters determined from underwater weighing. Little training is required for personnel operating the bioelectrical impedance analyzer, which is quite portable and inexpensive. These methods could lead to portable machines for doctors' offices, hospitals, sport teams, and even the public to keep tabs on body fatness and physical fitness.

Further evidence that a variety of foods are needed for a proper diet. A study was conducted with young men in a metabolic ward to test the effects of diet-fed sodium phytate and alpha-cellulose on the absorption of zinc and copper, which were isotopically labeled. The addition of cellulose did not affect the uptake of either trace element. On the other hand, the addition of large amounts of phytate to their diets impaired zinc absorption but did not affect the uptake of copper. However, copper uptake was found to vary among individuals from 27 to 44 percent. In another study, dietary phytate impaired the absorption and retention of iron, magnesium, phosphorus, and zinc. These findings indicate that diets which contain excessive amounts of phytate, as found in some leafy vegetables and legumes, may have a selective adverse effect on mineral absorption.

INTEGRATION OF AGRICULTURAL SYSTEMS

Current activities: The data and technologies needed to solve agricultural problems typically are developed by disciplinary research on the components of a system--such as soils, plants, insects, and livestock. Farmers, ranchers, and other resource managers traditionally have had to integrate new research findings into their own operations by trial and error--a slow, costly and high-risk process. The objective of systems research is to integrate scientific information and technologies into management aids that will help farmers, action agencies, and other users of research to make decisions that will result in lower input costs, higher quality commodities, and more sustainable agricultural systems. Physical and biological data are assembled into models that can account for the interactions among the different components of the systems being managed. The accuracy and validity of these models, and the utility of new technologies such as crop varieties and tillage practices, are established in appropriate pilot tests and field validation experiments before releasing the management aids to potential users. Multidisciplinary teams of scientists and engineers are organized into national networks to achieve the objectives of systems research. The products of systems research range from simulation models to help farmers determine the best methods for pest control, irrigation, tillage, seeding, and other practices to complex expert systems for assessing environmental impacts of processes such as soil erosion on national resources. Remote sensing technologies increasingly will be used to supply the data needed as inputs to these systems models.

Selected examples of recent progress:

Expert system helps manage crop cover of erosive soils. A new computer program that embodies expert knowledge will help provide increased protection for soil in the grain-farming region of the Pacific Northwest. Using air temperature records of prior years, the program will enable farmers to estimate the date by which fall seeding must be accomplished in order to provide enough crop cover to keep down soil losses from erosion during the following winter. Crop cover is the most important factor in management to control erosion.

Computer model simulates soybean growth. A simulation model has been developed that accounts for the basic physical and physiological processes involved in the movement of water, carbon, nitrogen, oxygen, and other materials in the soybean plant, soil, and atmosphere. This model makes it possible to predict the number and size of plant organs formed in response to environmental and management factors. Ultimately, farmers will be able to use this information to choose management practices that maximize profits and sustainability of the production system.

Peanut growth model will help farmers make management decisions. A cooperative venture between ARS and Virginia Polytechnic Institute researchers is developing an overall peanut growth simulation model to help farmers with decisions such as when to apply pesticides and when to irrigate. Weather stations now give farmers information they need to make fungicide applications to control Cercospora leaf spot disease. Full implementation of this model throughout the Nation's peanut growing area should help farmers reduce costs without increasing risk from diseases, pests, and drought.

Management support system being developed to control weeds in irrigated crops. Simulation models are being developed to help farmers reduce herbicide costs and minimize potential environmental hazards from weed control chemicals in irrigated crops. One model will predict the effect of soil-applied herbicides on weed population and groundwater contamination. As input information, it considers the current crop value, the herbicide cost, the amount applied, the cost of applying it, and the seed count and weed populations under alternative conditions. Another model makes similar predictions for postemergence foliar-applied herbicides, taking into account the actual weed population before recommending action. This management support system should help farmers minimize the use of herbicides to increase profit and reduce environmental risk.

Use of infrared aerial photography helps farmers reduce insecticide use. Cotton bolls in residues following harvest provide overwintering habitat for larvae of the boll weevil, cotton's most serious pest. Infrared photography has been used to detect the presence of larvae in residue bolls and thus to target fields for post-harvest boll-shredding operations. This technology is applicable throughout the Cotton Belt. In a test in the Rio Grande Valley, farmers credited a detection/control program with saving $25 to $30 million in one year and reported record yields with fewer insecticide applications. Decreasing the number of insecticide applications also helped spare beneficial insects that help control Heliothis, another cotton pest.

Computerized expert system being developed to manage agricultural production systems in the Corn Belt. ARS scientists working with five State experiment stations are developing a computerized expert system to help Midwestern farmers use their own personal computers in making decisions that will result in more profit and more sustainable production systems. The system is being developed to help farm operators manage such inputs as nutrients, water, herbicides, pesticides, tillage, and crop varieties. Increased profits and reduced risks to the environment are the objectives of these systems.

Use of remotely sensed data to predict soil water content. Soil water content is the dominant variable in the prediction of crop yields. Most methods of measurement are labor intensive and time-consuming. Remote sensing methods have been used to monitor soil water content in the upper few centimeters of soil. A model has been developed that allows agricultural managers, planners, and statisticians to use the remotely sensed surface water content data to predict water content throughout the root zone. This model brings us close to the possibility of an operational national system for collecting soil water data. When fully implemented, the system will have a far reaching impact on our capability to predict crop yields on a national basis and take appropriate action to cope with the consequences.

Model for assessing impact of soil erosion on long-term productivity completed. The Erosion Productivity Impact Calculator (EPIC) model has been completed and delivered to the Soil Conservation Service for use in natural resource assessments. This model predicts the consequences of alternative management of cropping systems on erosion and the ultimate impact of erosion on long-term productive capacity of the Nation's soils. Initial use indicates the model is computationally efficient and capable of realistically simulating the effects of management on erosion and crop production. The model has many other potential uses, for example, in national program planning and conservation policy studies, project planning and design, and research.

Predictive model for corn growth developed. A simplified version of the CERES-Maize crop growth model was developed. It takes into account both day-length and temperature in predicting dates of corn silking and maturity. Predicting these growth stages is valuable to breeding and management decisions and to yield predictions. It has been successfully tested on a wide range of corn hybrids in the United States, Canada, and Europe.

Rangeland production model for sagebrush sites validated. Rangeland models that simulate soil water and soil temperature regimes and the plant-growth-related processes of evaporation and transpiration provide a new and innovative tool for research on managing rangelands. A model has been validated and shown to be reliable for predicting the performance of sagebrush-grass rangelands. Such rangeland comprises about 115 million acres in the western United States. Management will be enhanced by predictions of herbage yield responses to different management practices and climatic conditions.

Integrated forage-livestock management significantly increases profitability. Winter and summer annual forages complementing native range markedly increased the efficiency of red meat production and improved net returns. Use in a forage-cow/calf production system resulted in a 30 percent increase in land-use efficiency, 100 percent improvement in beef production, and a 75 percent decrease in cost of production per pound of additional grain. Similar results were obtained from an integrated forage-stocker production system. Beef production was increased from 44 to 185 pounds per acre while land requirements were reduced from 8 to 2 acres per stocker unit.

AGRICULTURAL RESEARCH SERVICE

The estimates include proposed changes in the Language of this item as follows: (deleted matter enclosed in brackets.)

Buildings and Facilities:

For acquisition of land, construction, repair, improvement, extension, alteration, and purchase of fixed equipment or facilities of or used by the Agricultural Research Service [, where not otherwise provided, $6,312,000 to remain available until expended].

The change proposes excluding language authorizing acquisitions of land, construction, repair, improvement, extension, alteration and purchase of fixed equipment or facilities at Tuskegee Institute, Tuskegee, Alabama; Aberdeen, Idaho; University Park, Pennsylvania; Urbana, Illinois. Language for these activities will not be required in FY 1987.

AGRICULTURAL RESEARCH SERVICE

BUILDINGS AND FACILITIES

Appropriation Act, 1986		$ 6,350,000
Budget Estimate, 1987		- -
Decrease in Appropriation		-6,350,000
Adjustments in 1986		
Appropriations Act, 1986	$ 6,350,000	
Less Pro-Rata Reduction, P.L. 99-190	-38,000	
Net Appropriations	6,312,000	
Adjusted base for 1986		6,312,000
Budget Estimate, 1987		-0-
Decrease over adjusted 1986		-6,312,000

SUMMARY OF INCREASES AND DECREASES
(on basis of appropriation)

Items of Change	1986 Estimated	Program Changes	1987 Estimated
School of Veterinary Medicine, at Tuskegee Institute, Tuskegee, Alabama	$596,400	-$596,400	- -
Germplasm Collection Facility, Aberdeen, Idaho	2,683,800	-2,683,800	- -
Agricultural Science and Industry Facility Pennsylvania State University, University Park, Pennsylvania	49,800	-49,800	- -
Research Facility at University of Illinois, Urbana, Illinois	2,982,000	-2,982,000	- -
Total available	6,312,000	-6,312,000	- -

Project Statement

Project	1985 Amount	1985 Staff Years	1986 (est.) Amount	1986 (est.) Staff Years	Increase or Decrease	1987 (est.) Amount	1987 (est.) Staff Years
Construction ARS	$9,740,478	- -	$6,312,000	- - -	-$6,312,000	- -	- -
Unobligated balance	83,746,769	- -	- -	- - -	- -	- -	- -
Total available or estimate	93,487,247	- -	6,312,000	- - -	-6,312,000	- -	- -

JUSTIFICATION OF DECREASE

(1) An decrease of $6,312,000 for Buildings and Facilities:

BUILDINGS AND FACILITIES

Need for Change. Funds for projects contained in the FY 1986 Continuing Resolution totaled $6,312,000. The funds are available until fully expended and are not required in the FY 1987 Appropriation Act.

Nature of Change. No funds are requested for Buildings and Facilities projects in FY 1987.

Agricultural Research Service
Status of Construction Projects as of January 1986

Status of research facilities authorized in prior years and reported as uncompleted in the 1986 Explanatory Notes, is as follows:

NOTE: Design criteria, provided by ARS, specifies the program requirements for the facility and forms the basis for negotiation of architect-engineer contracts. Diagrammatic drawings or concept drawings provide the basis for the first review of the architect's design. Tentative drawings or architect's design are provided by the architect for firming up cost estimates and basis for developing the completed, and final working drawings.

Location and Purpose	Year	Amount of Funds Provided	Description
Arkansas, Booneville South Central Small Farms Research Center	1985 Plans and Construction....	$ 450,000	The AE contract was awarded in the third quarter of fiscal year 1985 and is expected to be completed in the second quarter of fiscal year 1986. Construction is projected for award in the third quarter of fiscal year 1986 with completion in the third quarter of fiscal year 1987.
Colorado, Fort Collins Arthropod-Borne Animal Disease Research Center	1979 Plans.....	700,000 a/	Design criteria and diagrammatic drawings were completed in the second quarter of fiscal year 1981. Estimated costs of construction were in excess of $40 million. It was decided that this was an unlikely option during the next few years, and the construction of a new facility was not essential for ARS to carry out its mission. The research program was relocated into facilities designed for animal disease research at an appropriate level of biological security at the University of Wyoming, a land-grant institution with compatible, complementary research activities.
Iowa, Ames National Soil Tilth Center	1984 Plans..... 1985 Construction..... Total.....	800,000 11,100,000 $11,900,000	AE contract for design was awarded in the fourth quarter of fiscal year 1984 and is expected to be completed in the second quarter of fiscal year 1986. Construction contract is projected to be awarded in the third quarter of fiscal year 1986, and completed in the third quarter of fiscal year 1988.

Status of Construction Projects as of January 1986 (Cont'd.)

Location and Purpose	Year	Amount of Funds Provided	Description
Idaho, Aberdeen Germplasm Collection Facility	1985 Plans.....	$ 300,000	The AE contract for design is projected for award in the second quarter of fiscal year 1986, and completed in the first quarter of fiscal year 1987.
Massachusetts, Boston Human Nutrition Research Center, Tuft University	1978 Plans.....	2,000,000	AE contract was awarded in fourth quarter of fiscal year 1978. Architect's design was completed in the fourth quarter of fiscal year 1979. Construction contract for Phase I (site work and excavation) was awarded in the first quarter of fiscal year 1980 and was completed in the fourth quarter of fiscal year 1981. Construction contract for Phase II (laboratory building) was awarded in the third quarter of fiscal year 1981 and completed in the fourth quarter of fiscal year 1982. Phase III (completion of remaining interior spaces) was awarded in the fourth quarter of fiscal year 1982. Completion was projected for the second quarter of fiscal year 1985. However, construction deficiencies required the investigative services of an AE firm. The deficiencies were identified and corrective action is being taken. Completion is projected for late in the third quarter of fiscal year 1986.
	1979 Construction.....	21,100,000	
	1980 Redirection.....	2,187,000 b/	
	1982 Redirection.....	1,490,748 c/	
	1982 Construction.....	5,896,000	
	Total.....	32,673,748	
Mississippi, Oxford USDA Sedimentation Laboratory	1985 Plans and Construction....	1,400,000	AE contract was awarded in the second quarter of fiscal year 1985 and is expected to be completed in the second quarter of fiscal year 1987. Construction contract was awarded in the first quarter of fiscal year 1986 and is scheduled for completion in the second quarter of fiscal year 1987.
Nebraska, Lincoln Old West Regional Veterinary School	1983 Plans.....	827,000	Old West School of Veterinary Medicine authorized and funded, provided (1) Nebraska could get other States in Region to participate in the Regional veterinary school, and (2) participating States come up with matching funds. Matching fund requirement has not been met so a grant has not been awarded.
	1984 Construction.....	12,050,000	
	Total.....	12,877,000	

Status of Construction Projects as of January 1986 (Cont'd.)

Location and Purpose	Year	Amount of Funds Provided	Description
Texas, Houston Children's Nutrition Research Center	1984 Plans..... 1984 Construction..... Total.....	$ 5,500,000 49,000,000 54,500,000	AE contract for design criteria and design was awarded the fourth quarter of fiscal year 1984. The design of the substructure was completed in the second quarter of fiscal year 1985, and the construction contract awarded in the third quarter of fiscal year 1985. The design of the superstructure was completed in the first quarter of fiscal year 1986. The construction contract is projected to be awarded in the third quarter of fiscal year 1986, and completed in the first quarter of fiscal year 1988.
Texas, Lubbock Plant Stress and Water Conservation Laboratory	1978 Feasibility Study. 1979 Plans..... 1984 Plans..... Total.....	100,000 800,000 500,000 1,400,000	AE contract for design criteria was awarded in the second quarter of fiscal year 1980 and completed in the fourth quarter of fiscal year 1980. The design contract for the central laboratory was awarded in the fourth quarter of fiscal year 1980 and was completed in the first quarter of fiscal year 1982. The design contract for the Plant Stress and Water Conservation Laboratory, including the redesign of the central laboratory, was awarded in the first quarter of fiscal year 1985. The design effort was suspended in the second quarter of fiscal year 1985, and the original lease agreement with Texas Tech. University expired in the fourth quarter of fiscal year 1985. The USDA and the University are currently negotiating a lease for a new site which is expected to be executed in the second quarter of fiscal year 1986. The AE design contract will be renegotiated after the lease is executed.
Virginia, Blacksburg Virginia-Maryland Regional College of Veterinary Medicine	1984 Construction.....	4,500,000	Preliminary design, including the diagrammatic or concepts drawings, is completed. Working drawings were completed in the fourth quarter of fiscal year 1984. Virginia Polytechnic Institute and State University awarded the construction contract using Federal Grant Funds and Regional State Participant Funds in the first quarter of Fiscal year 1985. Construction is expected to be completed in the second quarter of fiscal year 1987.

Status of Construction Projects as of January 1986 (Cont'd.)

Location and Purpose	Year	Amount of Funds Provided	Description
North Dakota, Fargo Sunflower and Sugarbeet Research Laboratory	1984 Plans..... 1985 Construction..... Total.....	$ 800,000 9,100,000 $ 9,900,000	Design criteria and preliminary design were awarded in the second quarter of fiscal year 1985 and is projected to be completed in the third quarter of fiscal year 1986. Construction is projected to be awarded in the fourth quarter of fiscal year 1986, and completed in the fourth quarter of fiscal year 1988.
Oklahoma, Lane South Central Agricultural Research Center	1983 Plans..... 1984 Plans and Construction.... Total.....	$ 350,000 1,575,000 $ 1,925,000	Design criteria and design for phase I were awarded in the second quarter of fiscal year 1984 and completed in the third quarter of fiscal year 1984. Construction contract for Phase I was awarded in the fourth quarter of fiscal year 1984 and is projected to be completed in the second quarter of fiscal year 1986. Phase II design was awarded in the third quarter of fiscal year 1985, and completed in the third quarter of fiscal year 1985. Construction was awarded in the first quarter of fiscal year 1986 with completion projected in the first quarter of fiscal year 1987.
Oregon, Corvallis National Forage Seed Production Research Center	1983 Plans..... 1984 Construction..... Total.....	$ 750,000 3,200,000 $ 3,950,000	AE contract for design was awarded in the fourth quarter of fiscal year 1984 and completed in the third quarter of fiscal year 1985. The construction contract was awarded in the first quarter of fiscal year 1986, and scheduled for completion in the second quarter of fiscal year 1987.

Status of Construction Projects as of January 1986 (Cont'd.)

Location and Purpose	Year	Amount of Funds Provided	Description
New York, Plum Island Plum Island Animal Disease Center	1973 Plans	$ 250,000	Construction of the laboratory additions was halted in March 1979 due to contractor default. The entire project consists of completing the Vaccine Storage Warehouse, Entry and Change Facility, Animal Facility, and the Diagnostic Research Laboratory and mothballing the Vaccine Research Laboratory. A contract was awarded in the second quarter of fiscal year 1980 for construction management services for the assessment and for the design and construction of the laboratory additions. The assessment of in-place construction and the construction of the Vaccine Storage Warehouse were completed in the fourth quarter of fiscal year 1981. Construction of the Entry and Change Facility and the initial phase of the Animal Facility was completed in the third quarter of fiscal year 1983. Design of the remaining phases on the Animal Facility and the Diagnostic Research Laboratory was awarded in the second quarter of fiscal year 1982. Construction of the Animal Facility was substantially completed in the fourth quarter of fiscal year 1985. Design of the Diagnostic Research Laboratory (DRL) is complete. Program changes in cooperation with Animal and Plant Health Inspection Service (APHIS) have necessitated a reexamination of the DRL facility requirements. Contract actions are suspended pending reconsideration. Critical elements for the mothballing of the Vaccine Research Laboratory were completed. Design for the completion of the mothballing operations have also been suspended pending the considerations concerning the DRL.
	1976 Construction	10,000,000	
	1977 Redirection	294,000 d/	
	1977 Redirection	700,000 e/	
	1978 Redirection	900,000 f/	
	1981 Construction	10,100,000	
	Total	$22,244,000	

AGRICULTURAL RESEARCH SERVICE

Passenger Motor Vehicles

The 1987 Budget Estimate does not include the purchase of additional passenger motor vehicles above the 472 passenger motor vehicles presently owned.

The passenger motor vehicles of Agricultural Research Service are used almost exclusively by professional research investigators and technical personnel in the course of their daily work. These personnel may need to travel to individual farms, ranches, commercial firms, State agricultural experiment stations, etc, requiring a high degree of mobility Use of common carriers are seldom feasible.

It is the policy of ARS to pool the use of motor vehicles for different activities in order to keep the number of vehicles to a minimum and reduce maintenance cost. Monthly vehicle operation reports and periodic surveys are maintained to determine the utilization and condition of the passenger motor vehicles.

Replacement of passenger motor vehicles. It is proposed to replace 118 of 472 vehicles (including 8 buses) currently in operation. These vehicles are located at field stations and are used in connection with research studies and technical assistance. All vehicles proposed for replacement have more than 60,000 miles or are more than 6 years of age.

Age and Mileage Data for passenger-carrying vehicles on hand as of September 30, 1985:

Age-Year Model	Number of Vehicles*	Percent of Total	Lifetime Mileage (thousands)	Number of Vehicles*	Percent of Total
1980-older	251	53	80-over	38	8
1981	54	12	60-80	127	27
1982	28	6	40-60	111	24
1983	63	13	20-40	120	25
1984	56	12	Under 20	76	16
1985	20	4			
Total	472	100		472	100

*Includes 6 vehicles used in foreign countries and 8 buses.

Aircraft

There will not be any additional acquisitions or replacement of the seven aircraft owned by ARS in FY 1987. These aircraft are located at College Station, Texas, and Weslaco, Texas. They are used in research of control methods, application of agricultural materials, infrared and color photography, and evaluating efficiency effects of weather conditions.

QUARTERLY REPORT
ON SELECTED RESEARCH PROJECTS
OF THE AGRICULTURAL RESEARCH SERVICE
U.S. DEPARTMENT OF AGRICULTURE
October 1 to December 31, 1985

Agricultural Research Service

CONTENTS

1 Human Nutrition
2 New & Improved Products
4 Soil, Water, & Air
6 Crop Production & Protection
11 Animal Production & Protection
13 "Expert" Information Systems

HUMAN NUTRITION

Trends in the average American diet will be easier to spot with a new computerized system expected to be ready in 1986. The system's components--an electronic scale, bar code reader, and portable computer--are streamlined to fit in the kitchens of families who volunteer for food intake studies. Current methods for determining food intake, such as the "food diary" or the "24-hour recall," are inaccurate, tedious, and expensive by contrast. Savings in time and money, plus expected gains in accuracy, will make the new system one of the first major advances in determining dietary patterns in more than 40 years.
Western Human Nutrition Research Center, San Francisco, CA
M. J. Kretsch, (415) 556-6231

Trained athletes don't suffer from sore muscles because their bodies are already geared up to repair muscle damage quickly, recent studies suggest. It now appears that individual muscle fibers tear apart at a "weak link" when contracted muscles are being lengthened, as in lowering a weight or walking downstairs. In sedentary people, the body responds to this damage as it would to an infection--by producing large amounts of the polypeptide interleukin-1. People who exercise regularly, however, maintain high blood levels of this polypeptide, which apparently triggers the repair process.
Human Nutrition Research Center on Aging at Tufts University, Boston, MA
William J. Evans, (617) 956-0333

People can maintain muscle quality throughout life with regular exercise, even though muscle mass inevitably declines with age. Men and women over 60 who underwent a moderate program of aerobic training had a 16% to 20% increase in functional capacity--a measurement that reflects the ability of skeletal muscles to use oxygen. As people age, their ability to repair damaged muscle fibers diminishes, resulting in the progressive loss of muscle mass. But current strength-training studies with men are showing that older people can increase the size of remaining muscle and decrease associated fat.
Human Nutrition Research Center on Aging at Tufts University, Boston, MA
William J. Evans, (617) 956-0333

Several fat-soluble vitamins can now be measured quickly, accurately, and at the same time from blood plasma samples as small as one-half milliliter. Clinicians or researchers can use the new high-performance liquid chromatographic method to separate and measure vitamin E, vitamin A, and other carotenoids. Nutritional assessment of these vitamins may be important in light of their reported roles in reducing cancer risk.
Grand Forks Human Nutrition Research Center, Grand Forks, ND
David B. Milne, (701) 795-8424

Breast-fed infants may be getting double protection against infections. Recent studies indicate that breast milk not only contains infection-fighting factors, it may also contain unidentified substances that stimulate the infant's immune system to produce its own protective factors. The low rate of clinical and subclinical infections seen in exclusively breast-fed infants may partly explain why they are able to use the energy and nitrogen in their diets more efficiently

than do infants whose diets include standard infant formulas.
Children's Nutrition Research Center at Baylor College of Medicine, Houston, TX
Cutberto Garza, (713) 699-6004

A high-fat intake--40% to 45% of total calories--increases risk of colorectal cancer, according to an intensive study of vegetarians and nonvegetarians living in the same geographical area. The typical American diet is about 40% fat calories. The study substantiated results of animal studies as well as mounting epidemiological evidence linking fat intake to colorectal cancer. It also confirmed that the presence of certain sterols and bile acids in the stool are good indicators for risk of this type of cancer.
Lipid Nutrition Lab, Human Nutrition Research Center, Beltsville, MD
Padmanabhan P. Nair, (301) 344-2583

Barley extracts may provide a natural way to alter the ratio of serum cholesterols and thereby reduce risk of heart disease and stroke from atherosclerosis. In studies with chickens, rats, and pigs, diets containing barley flour reduced the "bad" LDL-cholesterol up to 53% but did not significantly reduce the protective HDL-cholesterol. The active components were identified as a complex alcohol similar to vitamin E and a rare plant triglyceride. When added to chicken feed in minute amounts, the extracts also inhibited the liver enzyme that controls the animal's own synthesis of cholesterol.
Cereal Crops Research, Madison, WI
David Peterson, (608) 262-4482

NEW & IMPROVED PRODUCTS AND PROCESSES

Cotton fibers were grown in a laboratory test tube directly from cells without growing any other part of the plant. Research at Texas Tech University demonstrated that, for the first time, an agricultural commodity could be grown in a test tube from plant tissue suspended in a nutrient solution. When the gene chemistry of this growth is fully understood, the knowledge may be applied to improve the genetics of the cotton plant to produce longer and stronger cotton fiber. The work was partially financed by ARS as part of a project to improve fiber quality.
Cropping Systems Research Lab, Lubbock, TX
Jerry E. Quisenberry, (806) 746-6101

Tallow or beef fat can now be converted into water, fatty acids, and glycerin at low temperatures using a class of [illegible] or proteins called lipases. Such technology could replace the currently used high-temperature method, reducing energy costs and preserving some of the fat's natural qualities. This is the first time enzymes and membranes have been used together to produce fatty acids. Adoption of the new technology is a milestone to the billion-dollar-a-year fatty acid industry, which produces many industrial and household products.
Eastern Research Center, Philadelphia, PA
Dennis J. O'Brien, (215) 233-6601

A long-sought-after chemical has been found that stimulates plants to simultaneously increase nutrients and yields for the first time. Made from two commercially available compounds, the plant bioregulator, called DCPT, appears to work by increasing the flow and use of photosynthetic carbon in many crops tested, including cotton, soybeans, alfalfa, bushbeans, guayule, and lemon. The increased productivity per unit of input could benefit producers of many major commodities.
Fruit & Vegetable Chemistry Research Lab, Pasadena, CA
Henry Yokoyama, (213) 681-7294

Citrus canker on fruit can be controlled by dipping the fruit in chlorine. Studies show that bacteria that cause citrus canker can survive on the surface of untreated citrus fruit for 24 hours at room temperatures; in contrast, a 2-minute dip in 250-ppm chlorine and water killed the bacteria immediately. Chlorine-treated fruit can be shipped from areas contaminated with the canker without risk of spreading the surface bacteria. Last year, several million dollars in oranges were not exported

because of the canker problem and had to be used for juice.
Horticultural Crops Quality Lab, Beltsville, MD
Harold Moline, (301) 344-3128

Contamination of edible peanuts by natural toxins last year cost farmers, processors, and manufacturers $18.7 million to ensure that only the safest and most healthful peanuts reached the marketplace. Research has shown that when peanuts were water-stressed for 30 days before harvesting, they were contaminated by aflatoxins caused by the mold Aspergillus flavus; on the other hand, just 20 days of stress caused no contamination. This knowledge will help peanut growers more accurately predict when their crop might be contaminated so they will irrigate crops to prevent contamination and losses.
National Peanut Research Lab, Dawson, GA
Dick Cole, (912) 995-4441

A new type of filament-wrapped cotton yarn, named for its X-shaped structure, is stronger and can be stretched longer than conventionally wrapped yarns. Based on the Chinese finger puzzle where the more you pull, the tighter it gets, the X-wrap yarn twists to hold fibers close to the core. With this added protection, the yarn will not ball as much. Scientists have also invented a new device for making the X-wrap yarn.
Southern Research Center, New Orleans, LA
Gain L. Louis, (504) 589-7044

A gene that codes for a major wheat protein that determines flour quality has been cloned and its DNA sequence, or genetic code, determined. The availability of a pure form of this gene, called alpha-gliadin, and the knowledge of the information contained in its genetic code will permit bioengineering wheat flour protein at the molecular level. This is significant progress in developing ways to improve the baking quality of wheat flour that will benefit both consumers and producers.
Western Research Lab, Albany, CA
Frank C. Greene, (415) 486-3739

A portable meter suitable for use at supermarkets analyzes carbohydrates, carotene, and other constituents of papayas, onions, potatoes, cantaloups, and other produce. So far, the light-meter technology, called spectrophotometry, can measure sweetness in onions using near infrared light and carotene in papayas using visible light. Besides aiding consumers, such technology could also help plant breeders, growers, and packers screen large quantities of produce quickly.
Field & Horticultural Crops Research, Athens, GA
Gerald Dull, (404) 546-3320

Hamburger can now be tested faster, more cheaply, and more simply to determine how long the meat will retain its freshness until it is finally sold in supermarkets or used in fast-food restaurants. Originally designed to help buyers for the federal school lunch program, the patented test uses high-performance liquid chromatography to measure the lactic acid in meats. It takes about 1 hour as compared with 9 days for other techniques.
Engineering & Food Sciences Research, Albany, CA
A. Douglas King, (415) 486-3252

White blood cells needed to develop better vaccines and improve disease immunity in animals can now be collected continuously and in quantity from research animals. A small hollow plastic sphere, easily implanted under the animal's skin, has membrane-covered holes that only white blood cells can enter. Cells are flushed from the sphere and through an outlet tube with a syringe and saline solution. This technology is preferable to frequent bleeding of animals or sacrificing them to obtain an adequate supply of these cells. Also, cell biologists, immunologists, and other researchers will have purer cells that don't require processing to be isolated from whole blood.
Parasite Research Lab, Auburn, AL
Phil Klesius, (205) 826-4382

Cotton workers could be aided by two new tests based on a theory that microorganisms in cotton dust cause byssino-

sis, or brown lung disease. One quick test finds the level of micro-organisms on cotton bales by measuring the pH, or chemical acidity, of the bales. The other test can identify a large number of bacteria from numerous air samples, without testing each one individually, by simulating how the bacteria-laden dust settles in the passageways of workers' lungs.
Soil Microbial Systems, Beltsville, MD
Paul B. Marsh/Marion Simpson, (301) 344-3068

A microwave vacuum can dry rice efficiently without changing its cooking and eating qualities. At present, grain processors generally use fossil fuels to power the air-driers that remove water from rice so it can be milled and stored. But future fuel shortages or price increases could force processors to turn to alternative fuel sources, like an economical system powered by electricity.
Southern Research Center, New Orleans, LA
James I. Wadsworth, (504) 589-7012

Nigeria is planning to build a processing plant that will convert yam tubers, a major part of the diet of 100 million Nigerians, into edible, pre-cooked, dehydrated flakes. To eliminate storage problems that result in the loss of staple protein in yams, the plant will use the successful sweet potato-to-flake process developed by ARS researchers in 1962. The process has potential use for cassava, coco yam, white and sweet potato tubers, thus helping alleviate hunger in western Africa.
Southern Research Center, New Orleans, LA
Kenneth M. Decossas, (504) 589-7025

Acrylic plastics could be made from readily available renewable agricultural commodities instead of petroleum. The bacterium Klebsiella pnuemoniae can ferment up to 84% glycerol, a common byproduct of animal and vegetable fat processing, which eventually oxidizes into acrylic acid. Scientists have yet to determine if this process is economically feasible. Presently, acrylic is worth about 60 cents per pound, and billions of pounds are used annually to produce synthetic polymers such as plastics.
Northern Research Center, Peoria, IL
Patricia J. Sliniger, (309) 685-4011, Ext. 286

Processors of salad dressings that contain soybean oil may have new methods to permit longer use after opening. Exposure to oxygen causes soybean oils to become rancid. ARS researchers have found alternatives to hydrogenation, an expensive process used to make oils more stable. Using an antioxidant in the oil, or adding citric acid to inactivate the iron in the dressing, which hastens deterioration, or packaging it in a nitrogen atmosphere may be economical substitutes for hydrogenating the oil.
Northern Research Center, Peoria, IL
Timothy L. Mounts, (309) 685-4011, Ext. 555

Multicolored cloth can now be produced in a shorter time using cotton yarns treated with a new finish. By weaving undyed yarns that either absorb or resist a dye, a weaver can create a particular pattern, then dye the whole fabric to get a multicolored effect. Previously, to make a pattern, yarns had to be dyed beforehand and woven alternately to change the color of the fabric.
Southern Research Center, New Orleans, LA
Robert J. Harper, Jr., (504) 589-7063

SOIL, WATER, & AIR

ARS researchers have developed a workable reduced-tillage system for growing furrow-irrigated grain sorghum in the southern High Plains that may also prove successful with irrigated corn. The system increases the space between plant rows from the usual 10 inches to 30 inches and water furrow spacing from 40 to 60 inches. Grain yields using the wide-bed reduced-tillage system were 5% higher than with conventional tillage, and costs were reduced $3.50 per acre. Production efficiency was increased by lowering costs, time, and energy.
Soil & Crop Management Research Lab, Bushland, TX
Ronald R. Allen, (806) 378-5738

New ARS tests show that ozone levels that occur in the South reduce lint and seed yields of Stoneville-213 cotton by 11%. Earlier tests showed that the air pollutant reduces the yields of California-grown cotton by about 15% each year. Data on the response of field-grown cotton to various levels of ozone in the air will be used by the Environmental Protection Agency to set air-quality standards.
Air-Quality Plant Growth & Development Research Lab, Raleigh, NC
Allen S. Heagle, (919) 737-3311

The thriving poultry industry of the southern Piedmont gets rid of large amounts of broiler litter as fertilizer for forage crops, like Coastal bermudagrass. Interseeding the bermudagrass with annual rye increases the yields of high-quality forage by 32% to 35%, thus increasing nitrogen recovery in usable forage, while reducing both nitrogen concentrations and losses in bermudagrass pastures. This benefits both livestock feeders and the broiler industry.
Forage/Livestock Management Systems Research Lab, Watkinsville, GA
Stanley L. Wilkinson (404) 769-5631

Before reclamation laws were passed, bentonite miners left behind large tracts of barren mine spoils in Wyoming, Montana, and South Dakota. Mixing sawdust and other sawmill wastes, along with nitrogen fertilizer, into the spoil promotes the growth of perennial grasses and livestock forage. As a result of this research, 6,000 acres of abandoned bentonite-mined lands in Wyoming were recently scheduled for reclamation.
Mined Land Reclamation/Water Conservation Research Lab, Cheyenne, WY
Gerald Schuman, (307) 778-2220, ext. 2433

Conventional furrow irrigation for dry bean production in the West often wastes water and causes severe soil erosion, since fields are typically irrigated until the entire surface is wet. By irrigating only long enough for the water to reach the end of the furrow and then planting the bean seed in the bottom of the furrow a few days later, the quantity of water applied for preplanting was reduced 60%. Further, by limiting irrigation to the furrows where the beans were growing, total water applied was reduced 42% without affecting yields.
Soil Management and Water Quality Lab, Kimberly, ID
Robert D. Berg, (208) 423-5582

In the East, small cattle herds (100 head or fewer) are often fed in confinement in small or unpaved lots. Runoff water from the lots transports wastes and other pollutants into downstream waters. A newly designed system for measuring the amount and quality of the runoff revealed that quality was improved when the runoff water was forced through a shallow settling basin and into a tile-drained infiltration bed. The work provides action agencies with useful technology for controlling the quality of runoff from small feedlots.
North Appalachian Experimental Watershed Research Lab, Coshocton, OH
William M. Edwards, (614) 545-6349

A $100,000 ARS project to develop economical and reliable methods for mapping soils affected by salt accumulation has been funded by USDA's Soil Conservation Service. Scientists will employ new instruments that are fast and easy to use and that provide reliable data on a large scale. Salt accumulation is a potential danger on all irrigated cropland; in California alone, up to 1 million acres are starting to show damage.
U.S. Salinity Lab, Riverside, CA
James Rhodes, (714) 683-0170

A collapsible fabric dam that controls water levels of both a stream and its adjacent groundwater table may help overcome seasonal droughts in agricultural fields of mid-Atlantic states. Water pumped from behind such a dam supplied eight center-pivots, four volume guns, and one subirrigation system. Moreover, the raised water table sustained crop growth on nonirrigated parts of the 2,000-acre study area. Raising the water table also reduced the amount of subsurface drainage, thus reducing entry of nitrates into stream water by 50%.
Coastal Plains Soil & Water Conservation Center, Florence, SC
Coy W. Doty, (803) 669-5203

A cutback in erosion from 25 down to 0.002 tons per acre annually was achieved on a southern Piedmont watershed in 10 years with conservation tillage and balanced double cropping. Moreover, annual surface runoff was lowered from 18% to 0.5% of precipitation. Researchers gradually converted the 6.7-acre watershed--with slopes averaging 4%--from soybean monocropping to wheat/soybean double cropping, balancing erosion-prone row crops with closely spaced small grains. They changed rotations in response to weed problems, yield decreases, and nitrogen costs, most recently by drilling crimson clover into crop residues.
Southern Piedmont Conservation Research Center, Watkinsville, GA
George W. Langdale, (404) 769-5631

Atmospheric nitrogen is banked in the soil by soybeans in the southeastern Coastal Plain, whether grown by conventional or conservation tillage systems. Depending on seasonal rainfall, 15 to 125 lb per acre of nitrogen fixed from the atmosphere are made available for subsequent crops. This differs from the Midwest, where soybeans are often net consumers of soil nitrogen. Researchers advise managing the bonus nitrogen to avoid pollution by leaching or runoff. Effective practices include timely seeding of small grains, strip cropping, or maintaining a good cover of crop residues.
Coastal Plains Soil & Water Conservation Center, Florence, SC
Patrick G. Hunt, (803) 669-5203

Large worm holes may be significant channels for the rapid movement of fertilizers and pesticides through a crop's root zone into groundwater. Water colored with a dye and sprinkled onto a no-till cornfield in Ohio quickly drained through larger worm holes called macropores. The field, in no-till corn for 22 years, has excellent infiltration. In the past 5 years, runoff totaled 0.5 inches. No-till systems effectively control erosion and runoff. But agricultural chemicals may bypass the soil's fine pores and drain through macropores. Results from this research will be used to develop equations that predict such movement out of the root zone under no-till fields.
North Appalachian Experimental Watershed, Coshocton, OH
William M. Edwards, (614) 545-6349

Nitrate levels in groundwater were reduced about one-third in field experiments when ammonium-nitrogen fertilizer was treated with nitrapyrin, a bacterial growth inhibitor. The action of soil bacteria on ammonium produces nitrate, which leaches readily through soil into groundwater. High nitrate levels in drinking water are considered an objectionable pollutant.
North Appalachian Experimental Watershed, Coshocton, OH
L. B. Owens, (614) 545-6349

A modified method for predicting soil loss also includes the amount of soil deposited on a field from elsewhere in the calculation as well as the amount of soil lost to erosion. Recent studies on contoured land, similar to fields in the Corn Belt, show that more erosion results from slopes of short length and shallow grade than from steep long slopes. This theory contrasts with previous methods that use soil erosion as the only criterion for estimating average annual loss.
National Soil Erosion Research Lab, West Lafayette, IN 47907
L. Darrell Norton, (317) 494-8682

CROP PRODUCTION & PROTECTION

Primitive, nearly extinct races of peanuts--some descendants of plants grown by early man--have been collected from the coast of Peru. These late-maturing forms may have genes for tolerance to drought and heat that may improve our current commercial peanut varieties. Also collected were the nitrogen-fixing bacteria growing on the peanuts. They will be evaluated for their efficiency in converting atmospheric nitrogen to the form needed by plants.
Plant Science Research Lab, Stillwater, OK
Don Banks, (405) 624-4124

Alfalfa losses each year from disease and insects amount to about 40% of the annual $6 billion crop. Alfalfa germplasm, called KS189, was released this year with built-in protection against five major diseases and three major insects of this important forage. This new alfalfa was developed from an introduction from India and demonstrates the value of having diverse sources available for developing improved germplasm.
Plant Science & Entomology Research, Manhattan, KS
Edgar Sorensen, (913) 539-6101

Leaves of a cold-hardened citrus hybrid may contain substances that will help plant breeders and geneticists develop more cold-tolerant citrus varieties. Hybrid leaves contain fatty acids that are part of a larger molecule called triacylglycerol (triglycerides) similar to those found in a hardy species but different from those in a less hardy species. These substances may play a vital role in keeping leaf membranes fluid during freezing. Last year's freeze cost Florida citrus growers $253 million in losses.
Citrus & Subtropical Product Lab, Winter Haven, FL
Harold Nordby/George Yelenosky, (813) 293-4133/(305) 898-6791

The vulnerability of the entire U.S. sunflower crop to diseases has been lessened by broadening the genetic base for hybrid sunflowers. Until now, such hybrids have been produced for seed from a single source of cytoplasmic male sterility (CMS). CMS permits controlled breeding by allowing the desirable characteristics in sunflower genes to be more easily identified and more quickly incorporated into commercial hybrids. Such controlled-breeding ability will help commercial seed producers develop high-volume, low-cost hybrid seeds that are less vulnerable to diseases that otherwise could wipe out the $400 million seed industry that exports 80% of its yearly crop.
Oilseed Research Project, Fargo, ND
Jerry Miller, (701) 237-8155

The oil-producing enzymes (proteins) in the cells of soybeans have been located. Structures called plastids within the cells of seeds have been shown to form oil--a mechanism that differs from that in animals. Finding the location of the proteins that govern oil synthesis increases the likelihood of improving soybean oil production through plant breeding. U.S. soybean oil production is a $1 billion-a-year industry.
Soybean & Nitrogen Fixation Research, Raleigh, NC
Richard Wilson, (919) 737-3267

Screening peach and other fruit trees for improved disease resistance will be three times faster using tissue culture instead of conventional breeding. In one procedure, specimens of callus (soft tissue that forms over a wound from any plant part) from immature embryos from various types of peach trees were treated with a toxin from the bacterial leaf spot pathogen. Most specimens died immediately; those that survived were given heavier and heavier doses of the toxin until the most resistant types were found. These survivors will be cloned, grown to tree size, and field-tested for resistance. This technology may also help produce superior plants that are cold tolerant as well as disease resistant and avoid a disastrous crop loss like the one that destroyed the $350 million peach crop in the East this year.
Tissue Culture & Molecular Biology, Beltsville, MD
Freddi Hammerschlag, (301) 344-2752

Sorghum, an important food and feed crop, may now be improved faster using new techniques of biotechnology. A simple and easily reproducible method has been developed to isolate, culture, and sustain cell divisions of protoplasts (single cells without walls). The protoplast permits the insertion and expression of foreign genes into sorghum. Such technology will enable scientists to use tissue culture to reproduce cells and to form callus, giving breeders the tools to make rapid improvements in the crop.
Plant Science, Gainesville, FL
Prem Chourey, (904) 392-7237

The best barley for malting and brewing can now be distinguished from less suitable varieties currently used for feed. Protein extracts from the grain can be used to quickly identify its variety using electrophoresis (a technique that sorts out protein molecules on the basis of size). This "fingerprinting" ensures that all the grain is the same variety and of uniform high quality and will prevent problems for brewers. About half of the nation's barley crop is used to brew beer.
Cereal Crops Research, Madison, WI
David M. Peterson, (608) 262-4482

A fungicide can now effectively control chalkbrood--primary pest of leafcutter bee larvae. The bee is a major pollinator of alfalfa grown for seed in the Northwest. In field tests, scientists reduced the incidence of the disease by nearly 50% in bee domiciles dusted with the fungicide captan with no adverse affect on the bees or their larvae.
Pollinating Insect Biology Lab, Logan, UT
Frank D. Parker, (801) 750-2525

A new switchgrass variety, Trailblazer, accounts for a 35% increase in beef production per acre as compared with Pathfinder, a widely used commercial variety. The increased weight gain was brought about by only a 6% improvement in digestibility. Trailblazer was released in 1984, and certified seed will be commercially available in 1986. Primarily grown in the Central Plains and Corn Belt, the new grass or other improved warm-season grasses can be used to reseed about one-third the acreage in these areas.
Forage & Range Research, Lincoln, NE
Kenneth P. Vogel, (402) 472-1564

A natural chemical derived from leaves of the wild tomato may protect stored wheat from weevils. The chemical effectively repels and inhibits the growth of granary, rice, and maize weevils, without being toxic to humans or animals. A derivative was found to be more potent than the natural compound and might prove useful as a control for insect pests that have become resistant to currently approved chemical insecticides.
U.S. Grain Marketing Research Lab, Manhattan, KS
Karl J. Kramer, (913) 776-2767

An experimental variety of alfalfa that doesn't overwinter can produce about 60% more nitrogen during the fall of the seeding year than overwintering varieties commonly grown in the northern United States. The new alfalfa produces just as large a summer hay crop as traditional alfalfas. It fixes nitrogen in the autumn during the time when winter-dormant varieties are busy storing carbohydrates for overwinter survival. It is intended for use in rotations requiring only 1 year of alfalfa.
Plant Science Research, St. Paul, MN
Donald K. Barnes, (612) 373-0865

The 850,000-specimen National Fungus Collection, the largest collection in the United States, is now being computerized. Anyone interested can have easy access to information about occurrence and distribution of the 270,000 specimens of rusts, smuts, and polypores--wood decay fungi--already in the computer data base. The information could be used to correctly identify a fungus, for example, for a physician treating a victim of mushroom poisoning or for agricultural scientists trying to control fungal diseases of plants and animals.
Mycology Lab, Beltsville, MD
David A. Farr, (301) 344-2274

A new test can pick out types of white clover resistant to allelopathic chemicals--which inhibit the growth of other plants--produced by tall fescue. The chemical gives the fescue a competitive edge in pastures. The test, more accurate than previous ones, could be used to select resistant white clovers that are easier to establish and maintain in tall fescue pastures.
Crop Science Research Lab, Mississippi State, MS
Gary A. Pederson, (601) 325-2726

For the first time, crimson clover has been regenerated in the laboratory using a tissue culture technique called somatic embryogenesis. This technique could

regenerate thousands of plants from single cells by forming an embryo plant that eventually germinates into an adult plant. It may be the first step towards using tissue culture to produce improved forage legumes, such as arrowleaf, kura, white, and crimson clover species, with higher yields or improved resistance to disease.
Crop Science Research Lab, Mississippi State, MS
Gary A. Pederson, (601) 325-2726

Applying water often, up to once a day, can help shallow-rooted citrus trees grow better and produce more fruit in the sandy flatwood soils typical of south Florida. Currently, the trees are usually watered from irrigation furrows every 2 weeks, but this infrequent watering schedule cannot maintain adequate soil moisture during dry, warm spring months. With too little irrigation, water content of the soil near the roots is rapidly exhausted, thus severely reducing plant photosynthesis.
Plant Stress & Protection Research, Gainesville, FL
L. Hartwell Allen, Jr., (904) 392-6180

Germplasm of nitrogen-fixing legumes, some introduced from countries in Asia, Africa, and South America, is being developed to tolerate the semiarid conditions in the intermountain area of the western United States. Studies of the legumes thus far have helped in improving seed production and adaptation and have increased information about the problems of the millions of acres of grasses that get less than 12 inches of precipitation annually. Presently, no legumes, except those that are toxic to livestock, are well adapted to low rainfall areas.
Forage & Range Research, Logan, UT
Melvin D. Rumbaugh, (801) 750-3067

A sex pheromone from a parasitic worm of soybean roots has been isolated and purified for the first time. This cyst nematode destroys soybean crops, costing farmers losses of over $400 million a year. Scientists hope to use the pheromone to develop an environmentally safe control for the pest. This approach will lead to new strategies for controlling other plant nematodes that cause an estimated $6 billion damage annually to U.S. crops.
Nematology Lab, Beltsville, MD
Robin Huettel, (301) 344-3081

Researchers have found effective traps for the northern corn rootworm beetle, a pest of about 70 million U.S. acres of field and sweet corn. The best traps so far are yellow, baited with a sticky mixture of eugenol--a food lure that attracts Japanese beetles--and placed outside of cornfields at heights from ground level up to 10 inches. This is the first report of a pure chemical, not a pheromone, attracting the pest. The goal of capturing the beetle is to gain reliable data about the distribution and density of infestations and estimates of future populations.
Japanese Beetle Research, Wooster, OH
Thyril L. Ladd, Jr., (216) 263-3898

Bacteria called fluorescent pseudomonads that live on wheat roots can help protect the plants from Pythium root rot, a serious fungal wheat disease. Wheat yields may be increased as much as 26% when these beneficial bacteria are applied to wheat seed. This is especially significant since chemical treatment against Pythium is often ineffective and no known varieties of wheat are resistant to this root disease.
Root Disease & Biological Control Research, Pullman, WA
David M. Weller/R. J. Cook, (509) 335-6210

The pigment glands of some strains of cultivated cotton produce natural chemicals that may improve the insect defenses of the fiber crop. Researchers at ARS and Texas A&M evaluated chemical variations and effects on insects of terpenes--chemicals that repel or attract insects--from 30 cotton lines, including wild Australian cotton. Then they developed a "gene package" that may be bred commercially to control insect pests.
Cotton Pathology Research, College Station, TX
Alois A. Bell, (713) 260-9232

Procedures to synthesize strigol, an unusually active seed germinator, may help to better protect crops from plant pests. To see whether parasitic plant pests that require a host plant to live can be coaxed into "suicidal germination," ARS and cooperating researchers are testing several precursors (simple molecules formed as strigol is synthesized) and analogs (chemicals close in structure to strigol). The "suicide" comes when strigol and related chemicals "lie" to weeds such as witchweed and branched broomrape, causing them to germinate and sprout earlier than their host plants and thus starve to death.
Crop Protection Research, New Orleans, LA
Armand Pepperman, (504) 589-7564

For the first time, crop scientists have proposed creating a chronology—a history of sequential events—to explain how specific weeds affect a crop at different times in its life cycle. This idea stemmed from new findings that a reduction in yield of soybeans early in the growing season is a direct effect of weeds shading the beans. Later yield losses may come from further competition for light, water, or nutrients, as well as allelopaths—the chemicals plants use against other plants to maintain their dominance. All these aspects would be included in the chronology and could result in better methods to manage weeds and increase yields.
Crop Production Research, Columbia, MO
Richard J. Aldrich, (314) 882-2405

Farmers and homeowners may one day prevent weeds from sprouting. The top 6 inches of each acre of cultivated land harbors tens of millions of dormant weed seeds. Methyl isothiocyanate (MIT), the active ingredient in several all-purpose pesticides, directly kills weed seeds; most herbicides kill only the 5% to 10% of these seeds that emerge each year. When methods are developed for dispersing MIT evenly throughout the soil, the "seedicide" could practically eliminate pesky weeds.
Weed Science Lab, Beltsville, MD
John Teasdale, (301) 344-3504

A newly discovered mite may help control the spotted sunflower stem weevil, a pest of over 3 million acres of sunflowers grown in North and South Dakota and Minnesota. This tiny pyemotid mite engorges itself on the weevil's blood and can survive cold conditions, be kept dormant for more than a year, and live under water for days. It may be economically feasible to transport the submerged and engorged mass-reared mites and release them with one well-timed application in sunflower fields, thus controlling the stem weevil for 1 or more years without harming humans or other flora and fauna. Field tests must be run to determine if these mites can be released in time to significantly affect the sunflower stem weevil population.
Metabolism & Radiation Research Lab, Fargo, ND
John Reinecke/Sharon Grugel/John Barker, (601) 323-2230

A new strain of the fungus Colletotrichum coccodes, found in Minnesota, kills eastern black nightshade, a serious midwestern weed problem, especially in soybeans. The fungus does not infect potatoes and tomatoes, plants related to the nightshade. It can kill young weeds but needs 16 hours or more of 100% humidity to cause infection. With more research, the fungus may be successful for field application.
Weed Research Lab, St. Paul, MN
Robert N. Andersen, (612) 373-0877

New methods for crop and weed management could result from laboratory studies of Palmer amaranth, a weed common to the Southwest. Volatiles--easily evaporated organic compounds--from residues of the weed drastically reduce seed germination in onions by about 65% and in tomatoes and carrots by about 25%. Current research may help farmers decide when to safely plant onions and carrots in soils that contain amaranth residues, since they eventually stop giving off the yield-reducing volatiles.
Crop Protection Chemistry, New Orleans, LA
William J. Connick, Jr., (504) 589-7553

Status of Construction Projects as of January 1986 (Cont'd.)

Footnotes:

a/ $267,702 redirected from planning to cover the costs of transferring the research program to Laramie, Wyoming.

b/ Program funds in the amount of $2,187,000 were reprogrammed to fund additional costs for this project.

c/ Program funds in the amount of $1,490,748 were reprogrammed to fund additional costs to purchase building equipment for this project.

d/ $194,000 was redirected from the air pollution abatement and sewage treatment project to provide funds for pollution abatement facilities in the animal and laboratory project as originally planned. An additional $100,000 has been redirected into the animal and laboratory project from program funding.

e/ Due to cost escalation and to provide funds to complete facilities as originally planned and designed at the Beckley, West Virginia project and the Plum Island animal and laboratory project, funds in the amount of $2,209,000, were redirected from Kearneysville, West Viriginia. $1,509,000 was transferred to Beckley and $700,000 to PIADC.

f/ Program funds in the amount of $900,000 were reprogrammed to fund additional costs for this project.

A parasitic mite could add to the growing arsenal of biological control defenses to control pests on apples. The mite, Callidosoma metzi, was found feeding on adult male tufted apple bud moths. This major pest of apples destroys about 15% of the apple crop at harvest in the Shenandoah Valley of Virginia and neighboring states. About 29% of the moths collected each had from 1 to 13 immature mites. Besides helping to control moths, this mite at later stages may also attack small insects and other mites that destroy this valuable crop.
Appalachian Fruit Research, Kearneysville, WV
Mark Brown, (304) 725-3451

Cotton plants may soon be bred to be resistant to the boll weevil. Two new germplasm lines, already released to commercial plant breeders, are the first to be grown from primitive races of cotton that naturally repel the weevil. The new lines produce half the lint that commonly grown cotton does but have good flowering and fiber-producing characteristics, as well as built-in resistance to the boll weevil. Breeders can use the lines to develop superior cottons that can be grown with fewer, if any, insecticide applications.
Crop Science Research Lab, Mississippi State, MS
Jack C. McCarty, (601) 323-2230

Hairs on the leaves of a wild strawberry plant may offer a new defense against one of the fruit's worst insect enemies on the west coast. Hairs on the underside of leaves of beach strawberry, Fragaria chiloensis, repels black vine weevils that are tough to control with currently registered pesticides. Such resistance may be a genetic trait that can be transferred to commercial varieties. It could save 20% of this major strawberry-producing area's $40 million annual crop.
Horticultural Crops Research, Corvallis, OR
Robert Doss, (503) 757-4544

ANIMAL PRODUCTION & PROTECTION

Planting winter and summer annual forages dramatically increased the efficiency of native range in Oklahoma by markedly improving red meat production and net returns. Use in a forage-cow/calf production increased land-use efficiency 30%, improved beef production 100%, and decreased the production cost per pound of additional gain by 75%. Results were similar for an integrated forage-livestock production system: beef production was increased from 44 to 185 lb per acre, while land requirements were reduced from 8 to 2 acres per yearling steer.
Range & Pasture Research Lab, Woodward, OK
Phillip L. Sims, (405) 256-7449

The bloody range wars between cattlemen and sheepmen may have been based on a misconception, according to ARS scientists. In recent tests, sheep and cattle grazed the same range harmoniously with a net increase in pounds of meat to land used over exclusive grazing by a single species. That's because cattle prefer grass and just a few forbs; sheep, on the other hand, prefer forbs with a little grass. Further, the sheep improve grass production for the cattle by keeping the brush down.
Jornada Experimental Range, Las Cruces, NM
Dean M. Anderson/Clarence V. Hulet, (505) 646-5190

An organ culture system has been developed for short-term maintenance of intestinal sections from piglets. This will allow easier study of diseases associated with the intestine, such as porcine coronavirus, transmissible gastroenteritis virus, and a porcine herpes virus--pseudorabies virus. The organ cultures lend themselves to disease studies in which subtle cellular changes or sequential changes in intestinal tissues are difficult to observe in host animals. Apparently, this is the first time non-embryonic intestinal sections of either animals or humans have been maintained in test tubes for more than 3 hours without

marked decay. Intestinal sections remain viable for 5 days with this system.
National Animal Disease Center, Ames, IA
Phletus P. Williams, (515) 239-8398

Yellowjackets are highly beneficial predators of pests like caterpillars and flies, besides bothering humans at picnics. Researchers have found that a synthetic chemical attractant that was developed to better manage the beneficial spined soldier bug also works for yellowjackets. Since the chemical can summon females within short distances, homeowners may be able to use the lure to catch yellowjacket queens in the spring or trap workers that become a nuisance.
Insect & Nematode Hormone Lab,
Beltsville, MD
Jeffrey Aldrich, (301) 344-2631

Beef cattle given daily injections of bovine growth hormone converted more of their feed to muscle protein and less of it to fat. Scientists are researching exactly how the growth hormone changes the metabolism of cattle and feel that these preliminary experiments can lead to more efficient methods of meat production. The hormone is harmless to humans.
Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, NE
Joan H. Eisemann, (402) 762-3241

Lethal genes may be used in the future to control mosquitoes. Scientists have described genetic techniques to introduce six recessive, lethal, mutant genes into mosquitoes. The recessive genes act like time bombs; when the mosquitoes reproduce, the offspring inheriting these lethal genes die before they can lay eggs.
Insects Affecting Man & Animals Research Lab, Gainesville, FL
Jack A. Seawright, (904) 374-5940

A potentially dangerous parasite of sheep has been identified for the first time in North America. Until now, Nematodirus battus was thought to be limited to the British Isles and a small area in Europe, where it is a significant parasite of lambs. Now that the parasite has been newly found in western Oregon's Willamette Valley, ARS scientists are working with Animal and Plant Health Inspection Service and state researchers trying to determine the parasite's potential threat to the sheep industry.
Biosystematic Parasitology Lab,
Beltsville, MD
J. R. Lichtenfels, (301) 344-2444

A new shipping fever vaccine reduces losses in beef cattle that cost the industry millions of dollars annually. An active vaccine against one type of bacterium, Pasteurella haemolytica, that causes the pneumonia was effective in protecting cattle after two vaccinations. The vaccine needs to be refined before it can be released for commercial use.
Conservation & Production Research Lab,
Bushland, TX
Charles W. Purdy, (806) 378-5764

Implanted temperature-sensing devices may help keep future dairy cows healthy and tell farmers when to breed them. The devices send 1,024 temperature readings a day via radio to a computer. A change in temperature can indicate onset of an illness or other physiological changes such as the beginning of the estrous cycle. Installing such a system on a farm could save dairy farmers substantial sums by preventing lost milking time due to illness and by minimizing missed "heats."
Milk Secretion & Mastitis Lab,
Beltsville, MD
Alan Marc Lefcourt, (301) 344-2541

A new method has been found to protect dairy cattle from milk fever, a disease that costs the dairy industry about $150 million a year. Milk fever occurs shortly after calving; affected cows experience low blood calcium and paralysis. Intravenous infusion of a small amount of synthetic bovine parathryoid hormone a few days before and after calving prevented the disease. Commercial methods to produce the hormone and a suitable means for farmers to administer it to cows are being developed.
National Animal Disease Center, Ames, IA
Ronald Horst, (515) 239-8312

Avian influenza virus has been isolated from eggs of naturally infected chickens for the first time. Researchers can use

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this information to prevent the spread of this virus via eggs shipped for eating or hatching. Scientists from ARS and USDA's Animal and Plant Health Inspection Service collaborated on this research.
Southeast Poultry Research Lab, Athens, GA
Max Brugh, (404) 546-3433

A new oral vaccine prevents diarrhea in baby pigs. Nursing piglets fall victim to an often fatal bacterial diarrhea caused by the bacterium E. coli. Oral vaccination of the mother before the first and second lactations stimulated antibodies in the milk that protected the baby pigs. Current vaccination procedures protect the pigs for only the first few days after birth.
National Animal Disease Center, Ames, IA
Harley W. Moon, (515) 239-8253

Heartwater is a serious blood disease of cattle that originated in Africa and has spread to the Caribbean. Scientists fear that this tickborne disease will spread to the United States. A new rapid experimental test has been developed for heartwater that may help keep infected animals from being imported into the United States. It may also help quickly detect any outbreaks of the disease.
Plum Island Animal Disease Center, Greenport, NY
Linda Logan, (516) 323-2500

Beef cows selected for twinning rate could significantly cut meat producers' costs. Two-thirds of the feed cost for beef production go for feeding reproducing females. A study has shown that twinning rate can be increased by about 8% by selecting for twinning those daughters born to mothers that have had three or more sets of twins.
Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, NE
Keith Gregory, (402) 762-3241

White blood cells from cattle have been successfully fused with mouse cells to produce hybrid cells. These new fused cells produce pure bovine antibodies that resemble those that protect cattle from disease. The ability to produce large quantities of pure antibody in culture will allow scientists to determine how these antibodies function. This knowledge may lead to improved methods for protecting animals against disease.
Milk Secretion & Mastitis Lab, Beltsville, MD
Albert J. Guidry, (301) 344-2285

New markers that allow scientists to identify fat-prone pigs even before they are born may lead to leaner hams and pork chops. One marker, lipoprotein lipase (LPL), is an enzyme that controls the movement of fat molecules from the bloodstream to fatty tissues. Obese pigs have high LPL levels that they pass on to their offspring. However, low blood levels of swine growth hormone (SGH) signals this tendency toward obesity. Since pigs' cardiovascular and digestive systems resemble those in humans, such markers in humans may someday help streamline diets of infants genetically prone to be fat.
Animal Physiology Research Lab, Athens, GA
Gary Hausman, (404) 546-3584

A newly discovered organ in the stable fly, the largest found thus far in any fly species, could lead to new methods of controlling this serious livestock pest. The neurohemal organ, located next to the fly's heart, controls other organs by releasing hormones either directly on the organ, as an ordinary nerve would do, or at a distance by releasing them into the fly's body cavity. These neurohormones affect the heart and may regulate other vital physiological functions, such as the fly's biting behavior, reproduction, and growth—activities scientists some day hope to be better able to control.
Veterinary Toxicology & Entomology Research Lab, College Station, TX
Shirlee M. Meola/Benjamin Cook, (409) 260-9339

"EXPERT" INFORMATION SYSTEMS

A new computer model can save research time in developing cotton plants resistant to tobacco budworm, a major insect pest in the United States. The model tests the cotton plant's response to feeding by the insect larvae. When compared with 2 years of actual field data, it accurately predicted the yield and maturity of cotton artificially infested with budworm larvae. Scientists

expect to further improve the model and use it to examine other simulated genetic changes before breeding the plant in order to develop additional resistant cotton germplasm.
Crop Science Research Lab, Mississippi State, MS
Johnie N. Jenkins, (601) 323-2230

CREAMS is a mathematical model for evaluating the effects of various farm management practices on nonpoint-source pollutant loads at the edge of fields. Now Chemicals, Runoff, and Erosion from Agricultural Management Systems has been modified to calculate potential chemical loadings to groundwater. In tests, the model produced good results when compared with observed data on sandy soils in the Golden Sands area of central Wisconsin. The model will also be used in a groundwater research project, carried out cooperatively with the U.S. Geological Survey, to simulate root-zone loadings of agricultural chemicals.
Environmental Quality Research Lab, Tifton, GA
Ralph A. Leonard/W. G. Knisel (912) 386-3462

The first version of a new method for predicting soil losses from the action of water is scheduled for release in April 1989. Known as the USDA Water Erosion Prediction Project, it will replace the Universal Soil Loss Equation, developed by ARS and its cooperators 25 years ago and now in wide use throughout the world. Scientists expect to improve soil erosion prediction methods using modern computer technology and concepts based on fundamental erosion processes.
National Soil Erosion Research Lab, West Lafayette, IN
G. R. Foster, (317) 494-7748

Nitrate leaching to groundwater can be controlled with information from an updated and expanded computer model called Nitrogen-Tillage-Residue Management. The model predicts the best nitrogen fertilizer practices for producing high crop yields, while protecting the environment from excess nitrate leaching. The model is also a valuable research tool. Results of tests that would take several years with standard field-plot techniques can be calculated in a few weeks using the model.
Soil & Water Research Management, St. Paul, MN
M. J. Shaffer (612) 373-1444

A peanut growth simulation model will help farmers with crop management decisions such as when to apply pesticides and when to irrigate. The model is a cooperative project of ARS and the Virginia Polytechnic Institute. Weather stations already provide farmers with information to make fungicide applications to control Cercospora leaf spot disease. Full use of the model throughout peanut-growing areas should help farmers reduce costs without increasing the risk of disease, pests, or drought.
National Peanut Research Lab, Dawson, GA
Jim Davidson, (912) 995-4481

Basic physical and physiological processes involved in the movement of water, carbon, nitrogen, oxygen, and other materials in the soybean plant, soil, and atmosphere have been accounted for in a new simulation model. The model enables a user to predict the number and size of plant organs formed in response to environment and management factors. Ultimately, farmers will be able to use the information to select the best management practices for growing soybeans.
Crop Simulations Research, Mississippi State, MS
Donald L. Baker, (601) 323-2230

QUARTERLY REPORT
ON SELECTED RESEARCH PROJECTS
OF THE AGRICULTURAL RESEARCH SERVICE
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CONTENTS

1 Human Nutrition
3 New & Improved Products
6 Soil, Water, and Air
7 Crop Production & Protection
12 Animal Production & Protection
16 "Expert" Information Systems

HUMAN NUTRITION

Postponing cataracts through diet may be within sight. Sunlight and oxygen damage the unique light-transmitting proteins of the eye's lens. The damaged proteins clump together, clouding the lens. As people age, the enzymes that apparently clear away the damaged proteins become less effective, and cataracts form. Research shows that vitamin C and other "antioxidants" can protect the lens proteins from damage, while magnesium and manganese greatly enhance the ability of certain enzymes to dispose of the damaged proteins. These findings may lead to dietary recommendations that retard formation of cataracts.
Human Nutrition Research Center on Aging at Tufts University, Boston, MA
Allen Taylor, (617) 956-0371

Chromium is far more important than once suspected in maintaining glucose and fat (lipid) metabolism. Long-term deficiency can lead to adult-onset diabetes and cardiovascular disease. Recent chemical analyses show that most American diets are low in chromium. Nonprocessed foods--fresh fruits, vegetables, meat, and whole wheat products--provide ample chromium. Scientists found that runners excrete large amounts of chromium on days they exercise, indicating a need for high-chromium foods for this group. Also, diets high in simple sugars (glucose, fructose, and sucrose) cause people to lose chromium compared with diets high in complex carbohydrates (starchy foods and vegetables).
Vitamin and Mineral Nutrition Laboratory, Beltsville, MD
Richard A. Anderson, (301) 344-2091

Zinc and copper uptake may be enhanced during pregnancy, according to a recent study. When fed similar diets, pregnant women tended to absorb slightly more zinc and significantly more copper than nonpregnant women. The findings suggest that the special zinc Recommended Dietary Allowance for pregnant women--which is significantly higher than the RDA for other women--may need to be adjusted. And the change in copper absorption during pregnancy should be taken into account when setting the allowance for copper.
Western Human Nutrition Research Center, San Francisco, CA
Judith R. Turnland, (415) 486-3487

Guar bars reduced the severity of adult-onset diabetes in both men and women after a 6-month study. Five guar bars a day, eaten before meals, also helped the diabetics reduce their intake of taboo foods. The granola-type bars were made with 12% guar gum, a high-fiber gelling agent common in many processed foods. Although the bars supply three to four times more fiber than the average U.S. diet, they do not interfere with the uptake of iron, calcium, zinc, magnesium, manganese, or copper, as some other fibers can.
Carbohydrate Nutrition Laboratory, Beltsville, MD
Kay Behall, (301) 344-2396

Elderly people may need more vitamin E than the current RDA of 30 international units a day, studies with aging rats show. Certain areas of aging rats' brains lost some of this essential vitamin when their diets contained the amount considered adequate for all rats.

In another study, high doses (10 times adequate) of vitamin E improved the immune response of aging mice to a level comparable to that of young mice. Research is now underway to determine if high doses of vitamin E can improve older people's immune systems.
Human Nutrition Research Center on Aging at Tufts University, Boston, MA
Jeffrey Blumberg, (617) 956-0300

Thermogenesis literally means the generation of heat. Scientists use the term to describe the energy used by the human body to process food. ARS scientists are studying thermogenesis in human subjects because the amount of energy required to digest food seems to vary from person to person. Thermogenesis also varies at different periods of weight loss, possibly because the body becomes more efficient at processing food. This may explain why it becomes so hard to lose those "last few pounds" when dieting.
Western Human Nutrition Research Center, San Francisco, CA
Herman Johnson, (415) 556-9699

Body-fat monitoring is gaining popularity in health clubs as Americans become obsessed with leanness. Some people may, in fact, be harming themselves by reducing too much, shedding necessary fat stores. Women, for example, can become infertile at excessively low body-fat levels. Generally, men should have a 10 to 20% body fat content, women 20 to 30%, with 15% considered the norm for both. ARS scientists are testing the accuracy of several popular new methods for measuring body fat.
Energy and Protein Nutrition Research, Beltsville, MD
Joan Conway, (301) 344-2977

Many elderly people could suffer from severe anemia similar to pernicious anemia if they take broad-spectrum antibiotics. These drugs kill off necessary intestinal bacteria that produce folic acid and supply the needed amount of this essential vitamin. About 20% of senior citizens studied can't secrete enough acid to allow for the absorption of folic acid obtained from food. Normally, intestinal bacteria would produce enough folic acid to make up for the deficiency. Antibiotics complicate matters by destroying bacteria.
Human Nutrition Research Center on Aging at Tufts University, Boston, MA
Robert Russell, (617) 956-0300

Mounting evidence for selenium requirements is based partly on recent studies at the Beltsville Human Nutrition Research Center. To maintain a balance of this essential mineral, both men and women need a daily intake of about 0.5 micrograms per pound of body weight (or 50 micrograms for a 100-pound person). The good news is that North Americans are already getting adequate selenium. Beef, bread, eggs, chicken, and pork provide about half the dietary intake of this mineral, which is involved in protecting cell membranes against damage.
Vitamin and Mineral Nutrition Laboratory, Beltsville, MD
Orville A. Levander, (301) 344-2504

A moderate vitamin C supplement does not interfere with vitamin B_6 or B_{12} metabolism. Earlier studies had suggested that high levels of vitamin C might destroy B_{12} and cause excess urinary output of B_6. However, volunteers in a recent study consumed 600 milligrams of vitamin C in their diets each day--the amount in a normal diet--plus one supplementary vitamin C tablet. There was no significant change in blood levels of either B_6 or B_{12} or in urinary excretion of B_6. The volunteers' intake was about ten times the RDA for vitamin C.
Western Human Nutrition Research Center, San Francisco, CA
Robert A. Jacob, (415) 556-3531

A quick and accurate method for measuring vitamin C in the blood can be used to monitor blood levels and detect changes long before an actual deficiency occurs. Until now, the most common methods didn't distinguish between actual vitamin C (ascorbic acid) and a closely related compound (isoascorbic acid). Because isoascorbic acid doesn't produce the same benefits as the vitamin

itself, results of these analyses were misleading. The new procedure not only solves that problem, it can also detect much smaller amounts of the vitamin.
Western Human Nutrition Research Center, San Francisco, CA
Stanley T. Omaye, (415) 556-0060

Does chronic obesity affect a person's use of dietary minerals? Doctors have reported that some obese children and adolescents have low blood levels of iron and zinc. To study this phenomenon, scientists turned to laboratory animals. Obese rats showed significantly lower levels of zinc, iron, copper, and manganese in their tissues than their lean littermates. Studies are underway to determine how chronic obesity alters tissue concentrations of these minerals and if a marginal intake of minerals affects obese animals more severely than lean animals.
Vitamin and Mineral Nutrition Laboratory, Beltsville, MD
Mark Failla, (301) 344-2022

Dietary boron increased growth rates and decreased incidences of rickets in laboratory chicks fed diets low in an active form of vitamin D. Additional findings from the experiment on interactions of dietary boron, calcium, magnesium, and vitamin D_3 suggest a metabolic role for boron, possibly involving the parathyroid gland. If findings from the studies on animal models lead to establishing a role for boron in human nutrition, assessment of the levels of boron in U.S. diets might have to be made.
Grand Forks Human Nutrition Research Center, Grand Forks, ND
Forrest H. Nielsen, (701) 795-8456

NEW & IMPROVED PRODUCTS AND PROCESSES

Africanized or "killer" bees can be distinguished from domestic honey bees with a fast, accurate test involving simple measurements of wings and other body parts. The ARS-developed system can be taught quickly to state and local technicians.
Bee Breeding and Stock Center Laboratory, Baton Rouge, LA
Thomas Rinderer, (504) 766-6064

Cold damage in some fresh produce can be gauged by measuring light emitted from fruits and vegetables that contain chlorophyll. A scientist has developed a rapid method for measuring the delayed light emission from produce to indicate the extent of any chilling injury. Damage from keeping fruit too cold for too long could previously be measured only by cutting open the fruit. The method will also detect other kinds of produce stress.
Horticultural Crops Quality Laboratory, Beltsville, MD
Judith Abbott, (301) 344-3128

Fresh pigskins can be processed into leather a new way without curing. The ARS-developed process, which eliminates salt curing and the attendant water pollution, can help the U.S. leather industry make its products more competitive with imported leather products. Eliminating the curing step also improves grease and nonhide-protein recovery.
Eastern Research Center, Philadelphia, PA
William J. Hopkins, (215) 233-6435

Corn treated with the insecticide ethylene dibromide (EDB), after being stored for 180 days, contained only 16 parts per billion of the chemical--far below the Environmental Protection Agency guideline of 900 ppb in grain. Processing corn into flakes, grits, meal, etc., further reduced EDB levels, as did extracting and refining oil from the crop. Knowing how much EDB remains after storage will help scientists make recommendations for safe use of crops treated with the compound, which causes cancer and genetic defects in laboratory rats.
Northern Research Center, Peoria, IL
G. T. Bookwalter (309), 685-4419

A biological control agent of grasshoppers can be produced more cheaply than ever, making it an

inexpensive, natural alternative to chemicals. Nosema locustae, which kills grasshoppers by destroying egg-producing tissues, is made by inoculating hoppers with the microbe. The new, three-step plan cuts today's production cost by 50 to 70% and should provide industry with a way to produce the biocontrol easily and inexpensively.
Rangeland Insect Laboratory,
Bozeman, MT
J. E. Handy, (406) 994-3344

An instrument that identifies the strongest insect attractants has been developed. Knowing which chemicals most effectively lure insect pests will help scientists develop effective biological controls. The new instrument, called the dual choice olfactometer, offers insects two natural lures--a chemical attractant taken from a pest's favorite plant and a sex pheromone, for example. Whichever chemical lures the insects will be the best candidate for synthesis of a natural control. The olfactometer works similarly for repellants.
Boll Weevil Research Laboratory,
Mississippi State, MS
Joseph C. Dickens, (601) 323-2230

Electronic marketing of baled hay, a crop worth $10.7 billion yearly, may be practical with vans equipped to analyze within minutes hay quality on site. Such analyses typically require a week, with samples mailed to labs. The vans, equipped with near infrared reflectance spectroscopy (NIRS) technology pioneered at Beltsville, MD, analyze hay at farms and auctions for protein and minerals. In Wisconsin alone, hay auctions using NIRS analysis have increased from 40 to 92 in the last 2 years.
Plant Science Research, St. Paul, MN
Gordon Marten, (612) 373-1679

Lawsuits or disputes about the identity of patented plants may be settled with a manual which explains how to compare electronic "fingerprints." Three-dimensional scanning electron micrograph (SEM) images of a leaf hair or pore of a known cultivar can easily be compared with that of the contested cultivar, since specimens are magnified up to 75,000 times for examination on a TV screen. (Cultivars are plant varieties that are cultivated rather than occurring naturally.) Research for the manual was partly funded by the industry on behalf of plant patent owners seeking a more reliable way to identify plants than "expert opinion." About 3,500 plant patents have been granted, most of them for plants sold by nurseries and greenhouses, a $5 billion a year business.
Nursery Crops Research Laboratory,
Delaware, OH
Charles Krause, (604) 363-1129

New procedures developed by ARS and USDA's Forest Service will lower the cost of manufacturing the powerful synthetic sex attractant that effectively controls the carpenterworm, a destructive pest of southern hardwood forests. The new procedure removes the chemical structures that had inhibited the effectiveness of the attractant.
Insect Attractants, Behavior, and Basic Biology Research Laboratory,
Gainesville, FL
R. E. Doolittle, (904) 374-5723

A simple nondestructive flotation technique that requires only water, sugar, and salt, can select wheat seeds containing the most protein. Beginning with high-yielding kernels, a breeder can skim off the top 1% for protein content by adjusting the solution. The technique is an especially useful tool for wheat breeders in developing countries where laboratory facilities are limited or nonexistent.
Wheat Research Laboratory, Lincoln, NE
C. James Peterson, (402) 472-5191

Insects in stored foods may be detected by the sound of their chewing, using a stethoscope attached to an amplifier. Such detection may make it possible to export commodities without fumigation--saving millions of dollars worth of U.S. trade in certain fruits.
Insect Biophysics Research,
Gainesville, FL
J. C. Webb, (904) 373-6701

Mosquitoes can be better controlled using a new class of insecticides--synthetic pyrethroids--that mimic the

more expensive but very effective insecticide pyrethrin, which is made from chrysanthemums. Of seven pyrethroids evaluated, cyfluthrin proved the most effective. Using less pyrethoid overall gives more effective control than the commonly used malathion, to which many mosquito species have developed resistance.
Insects Affecting Man and Animals Research Laboratory, Gainesville, FL
D. L. Kline, (904) 374-5933

Better quality cotton fiber as well as lower energy costs, noise, and air-pollution levels are possible with the first combination cotton gin/lint cleaner. The new design combines a gin stand and two lint cleaners into a single unit, and would replace the air-transport machinery currently used.
Southwestern Cotton Ginning Research Laboratory, Mesilla Park, NM
S. E. Hughs, (505) 526-6381

Moving air intake vents in cotton gins from the bottom to the top of the gin where hot air collects can save operators 15% of the overall cost of drying cotton or as much as 75% of the cost of secondary drying.
Cropping Systems Research Laboratory, Lubbock, TX
Weldon Laird, (806) 762-7413

To detect and intercept infestations of foreign khapra beetles at the southern border of the United States, federal agents are using an inexpensive trap developed by ARS to control insects in stored products. USDA's Animal and Plant Health Inspection Service recently purchased 2,200 cardboard traps that capitalize on the insect's propensity for hiding in cracks. They employ a food attractant and sex pheromone to lure the pest to the trap's center, where it suffocates in a reservior of mineral and vegetable oils. This technology--now being used by grain storage and mill managers worldwide--quickly monitors insect migration and buildup. Such early detection should curtail accidental introductions of the foreign pest, thus avoiding large-scale chemical fumigation and treatments. Each year such insects damage or destroy roughly 5 to 10% of U.S. stored products.
Stored-Products and Household Insects Laboratory, Madison, WI
Wendell E. Burkholder, (608) 262-1732

Woolens treated with pyrethroid insecticides to protect against moths and beetles can be stored safely for longer than the 6-month time now claimed on the labels of these products. Tests show that the treatments will protect woolen fabrics stored in the dark for as long as 6 years.
Stored-Product Insects Research and Development Laboratory, Savannah, GA
Roy E. Bry, (912) 233-7981

Holes made by cattle grubs in hides sold for leather significantly lower their value. A vaccine is being sought that relies on the animal's own immune system to fight off the hole-boring parasite. So far, a crude vaccine has been developed that makes young cattle as resistant to the pest as older cattle become naturally. Once scientists have isolated the antigen that prompts infected animals to build immunity to the grub, they can develop a pure and effective vaccine by cloning the protein antigen. Such a vaccine could save consumers and the cattle industry about $600 million yearly.
U.S. Livestock Insect Laboratory, Kerrville, TX
John Pruett, (512) 257-3566

More cheddar cheese can be produced in less time, at less cost, with no additional equipment with a new ARS process. Using commercial starter cultures for making cheddar, the new method cuts processing time by as much as 30% by eliminating the traditional ripening step.
Eastern Research Center, Philadelphia, PA
J. F. Flanagan; Virginia Holsinger, (205) 233-6516

Nature's own insecticides, like toxic bacteria, may not withstand insect pests, as previously assumed. After only four generations of exposure, the Indianmeal moth, a major common grain pest, can become resistant to

Bacillus thuringiensis or BT, the most widely used biological insecticide. Previous attempts to breed insects resistant to BT were unsuccessful because they relied on inbred laboratory strains of insects, while in this study wild strains were used. Fortunately, this potential problem has been identified before grain-storage operators suffered economic losses. Followup studies will examine how resistance to the bacterium develops and how BT works to control insects.
U.S. Grain Marketing Research Laboratory, Manhattan, KS
William McGaughey, (913) 776-2705

SOIL, WATER, AND AIR

Farmers running short of irrigation water in the Southern High Plains (parts of Texas, Oklahoma, New Mexico) can adopt a dryland farming system that will hold down soil erosion while providing adequate water for crop production. The system calls for a 3-year rotation of wheat-sorghum-fallow combined with either stubble mulch tillage or no-till. Residue from earlier crops protects the soil from hard rains and runoff. In field tests, annual soil losses during the wheat sequence were less than half a ton per acre with either stubble mulching or no-till. Even during the fallow sequence, losses were well below levels injurious to the soil, and losses under no-till were practically nil.
Conservation and Production Research Laboratory, Bushland, TX
O. R. Jones, (806) 378-5738

Free labor from soil microbes can best be exploited when pore space in soil filled with water stays near 60%. At that point, aerobic (oxygen-needing) microbes are most active, as gauged by the amount of carbon dioxide they give off from breathing. Bacteria and fungi work hard to unlock nitrogen and other nutrients in soil organic matter, making them available to plant roots for uptake. However, above 80% water-filled pore space, aerobic microbes slow down and their opposites, anaerobic microbes, thrive. These anaerobes waste plant-available nitrogen--from organic matter or fertilizer--by releasing it into the air as gas. Tests of the pore-space concept on both plowed and unplowed plots in four states show it to be a reliable and simple way to measure soil microbe activity.
Soil and Water Conservation Research, Lincoln, NE
John Doran, (402) 472-1510

Costs are drastically reduced for ARS-designed stream stabilization structures used by the Soil Conservation Service and the U.S. Army Corps of Engineers. The "low drop" grade control structures use rocks and steel sheets, rather than concrete, to break the force of what were once destructive waterfalls. Stilling basins downstream quiet streams before they can flow on--and provide excellent fish habitat.
USDA Sedimentation Laboratory, Oxford, MS
W. Campbell Little, (601) 234-4121

Subsoil compaction from wheel traffic of heavy harvest and transport equipment can extend as deep as 2 feet or more if the soil is wet at the time of traffic. Studies in Minnesota show that this compaction has persisted for at least 4 years in spite of annual soil freezing and has reduced corn yields up to 27% and soybean yields up to 19%. Part of the decrease for corn was caused by reduced nitrogen uptake from denitrification and restricted root growth. Compaction does not affect corn and soybeans the same way.
North Central Soil Conservation Laboratory, Morris, MN
Ward Voorhees, (612) 589-3411

Preventing fungus diseases in no-till acreage is the aim of ARS plant pathologists in Frederick, MD. Special greenhouse facilities there simulate the high humidity of the South, where crop residues can become breeding grounds for fungal plant diseases. Researchers are developing crop management practices, such as planting earlier maturing varieties and crop rotation, to reduce the spread of disease. These practices

may also encourage farmers to apply more no-till and low-till systems to reduce soil erosion.
Plant Disease Research, Frederick, MD
Frances Latterell, (301) 935-2632

Ground-penetrating radar can zero in on deeply hidden water channels that can carry pollutants from beneath a crop's root zone into an aquifer. Such radar is a kind of surveyor's tool for charting topographic maps underground--rather than on its surface. By mapping rebounding radar echoes, scientists can pinpoint those soil layers that water won't penetrate that correspond to aboveground slopes, ridges, and valleys. Such watertight layers may form channels. Radar mapping, especially of porous layers such as limestone and sandstone, can lead to better ways of tracing or predicting routes traveled by leachable pesticides or fertilizers if they move downward and sideways into aquifers. Groundwater supplies about half of the nation's drinking water.
Environmental Quality Research,
Tifton, GA
Ralph Leonard, (912) 386-3462

Planting more native warm-season grasses in pastures in the Corn Belt and Northeast can mean more beef per acre--enough to pay some farmers with sloping, eroding acres to switch from growing row crops to feeding cattle. Grasses that do best in hot summer months include Indiangrass, switchgrass, and big bluestem. Warm-season pastures can supplement pastures planted with cool-season grasses, like bromegrass, tall fescue, and orchardgrass. Taken together, the pastures can carry more cattle and provide nutritious forage for 230 to 240 days. ARS scientists also report potential for further genetic improvement of warm-season grasses. Switchgrass, for example, has already been made more digestible, resulting in substantial increases in beef production.
Forage and Range Research Unit,
Lincoln, NE
Kenneth P. Vogel, (402) 472-1564

A test based on rabbit blood serum can detect pesticides in soil, water, food, and other materials. This simple, inexpensive test could help government and private agencies monitor pesticides rapidly and accurately. With the help of special equipment, 96 samples can be analyzed in seconds. A totally automated system could analyze 2,000 samples a day.
Central Great Plains Research Station,
Akron, CO
Bohn D. Dunbar, (303) 345-2259

Two new herbicides are acceptable alternatives to 2,4,5-T to control honey mesquite (Prosopis glandulosa), which now infests more than 90 million acres of rangeland in the southwestern United States. Triclopyr, now on the market, is slightly better at controlling mesquite than 2,4,5-T, and clopyralid, which is not yet registered by EPA, is superior to all presently known herbicides.
Grassland Protection Research Unit,
College Station, TX
Rodney W. Bovey, (409) 260-9238

Several natural insect enemies of mesquite found in Argentina are promising candidates for introduction to the United States and could save the livestock industry $200-500 million. Using the insects as biological controls could greatly reduce the number of mesquite plants, which lower grass production, cause erosion, and waste soil water in the southwestern U.S.
Grassland, Soil and Water Research Laboratory, Temple, TX
Culver J. DeLoach, (817) 774-1201

CROP PRODUCTION AND PROTECTION

Plants grow 2 to 4 times faster with a new automated and computerized tissue culture system than with traditional tissue culture techniques. With the old method, plants had to be transferred regularly to new liquid solutions of nutrients (agar). The new system, which is inexpensive to build, drains off the

old solution every 2 hours to pump in a fresh supply while leaving plants undisturbed. Commercial growers and researchers can use the system to produce sturdy, fast-growing plantlets of citrus, carrots, orchids, date palms, and many other species.
Fruit and Vegetable Chemistry Laboratory, Pasadena, CA
Brent Tisserat, (213) 681-7294

A few surviving American elm trees in one Ohio town appear naturally resistant to Dutch elm disease. Cuttings from these trees are promising even after direct inoculations with the Dutch elm fungus. If found to be resistant, these few trees may become the genetic foundation for re-establising the American Elm. Meanwhile, the U.S. National Arboretum recently released two new elm varieties, 'Homestead' and 'Pioneer', both resistant to Dutch elm disease.
Nursery Crops Research, Delaware, OH/ U.S. National Arboretum, Washington, DC
Lawrence R. Schreiber, (614) 363-1129/ A. M. Townsend, (202) 475-4847

A half-inch long fly, so obscure it has no common name, is a promising weapon against insect larvae that annually devour billions of dollars worth of food, feed, and fiber crops. Preliminary tests showed the tiny fly, Archytas mecoratus, in its maggot or larval stage suppressed corn earworms and fall armyworms by invading the bodies of these pests, preventing them from developing into moths. In their worm stage, these pests cost the United States an estimated $1 billion yearly in destroyed cotton, corn, soybeans, and other crops, plus the cost of controlling them.
Insect Biology and Population Management Research, Tifton, GA
Harry Gross, (912) 382-6904

Potatoes for export as frozen french fries are being grown in Thailand as a substitute for opium poppies. Over the past 4 years, ARS has encouraged the Thais to switch to Russet Burbank potatoes that an American firm there is trying to introduce as french fries to nearby fast-food chains throughout Asia. Such alternative crops have reduced by half the area where poppies were once grown for opium export. Thanks to ARS cooperation with Thai scientists, local farmers are growing more profitable alternative crops, forsaking the illicit trade in poppies, some of which reaches the United States.
Narcotics Substitution Project, Chiang Mai, Thailand
Jack Bond, (9011 6653 245888)

The number of hairs on the underside of beach strawberry (Fragaria chiloensis) leaves has something to do with repelling black vine and possibly other weevils. Having found heavy hairs on the underside of the leaves of a particularly resistant plant, scientists removed the hairs and the plant lost its resistance. Since 1974, when pesticides effective against weevils were banned, weevil destruction of plants has been on the rise.
Horticultural Crops Research Laboratory, Corvallis, OR
Robert P. Doss, (503) 757-4544

The seven-spotted lady beetle, a voracious predator of some 200 species of aphids that destroy valuable crops like peas and other legumes, was at one time found only in the marshlands of New Jersey. Scientists collected thousands of these beneficial beetles and distributed them widely throughout afflicted Eastern areas. Decendants of these beetles now protect a large range of Eastern-grown crops, including alfalfa, cereals, and corn, and are frequently the dominant lady beetle in these crops. The project proved so successful that USDA's Animal and Plant Health Inspection Service is considering funding a program to further distribute the predator throughout the Western United States.
Beneficial Insects Introduction Research, Newark, DE
Richard Dysart, (302) 731-7330

Rust, a serious disease of many kinds of beans in the East and Midwest, can be controlled by spraying leaves with a natural bacterium. In some test plots, the bacterium (Bacillus subtilis) almost completely controlled the leaf disease—

results that so impressed the chemical industry that several companies expressed interest in commercializing this, the most advanced technology for biocontrol of a foliar plant disease. Rust can cost the bean industry up to $250 million a year.
Plant Pathology Laboratory,
Beltsville, MD
Rennie Stavely, (301) 344-3577

A newly found nitrogen-fixing bacterium may improve the productivity of soybeans. Mutants from a strain of Rhizobium japonicum, a rhizobium that makes nodules (the small knots on legume roots that house the bacterium) change the amino acid tryptophan into growth-stimulating hormones. Since the mutants can still fix nitrogen and nodulate soybeans, researchers want to find out whether plants with bacteria nodules are benefited.
Northern Research Center, Peoria, IL
Tsuneo Kaneshiro,
(309) 685-4011, ext 243

Using mycorrhizae to control insects could reduce insecticide use and yield losses by 20%. Mycorrhizae are a beneficial association of fungi and plant roots. The mycorrhizae may fight off leaf-chewing pests such as corn earworm and fall armyworm. Laboratory tests suggest that the mycorrhizae change the nutrient makeup in the leaves of soybean plants and thus deprive worms of sufficiently nourishing food.
Plant Physiology and Chemistry,
Albany, CA
Raymond S. Pacovsky, (415) 486-3321

New breeding lines of soybeans that lack the protein that inhibits trypsin--an important digestive enzyme--could save as much as fifty cents per bushel for beans used as feed for chickens and swine. Normally the protein in raw beans inhibits the production of trypsin in the pancreas, and the bean can be effectively digested only when crushed and cooked. Beans from the new breeding lines require less processing to inactivate the inhibitor.
Soybean Germplasm Collection,
Urbana, IL
Richard L. Bernard, (217) 333-4639

New disease-resistant grape rootstock is ready for release in California. The rootstock, developed cooperatively by ARS and the University of California-Davis, is resistant to the grape fan leaf virus and to the nematode which spreads it. Growers in California have tried unsuccessfully for 25 years to wipe out the nematode with soil fumigants. The fan leaf virus causes annual losses of nearly $25 million in the state's Napa Valley and Lodi areas.
Crops Pathology Research, Davis, CA
Austin Goheen, (916) 752-6896

Cut flowers may last three times as long by adding a new chemical called AOAA to vase water. AOAA inhibits the plant's ability to produce ethylene, an aging hormone. AOAA must still be approved by FDA before it can be marketed.
Horticultural Crops Quality Research,
Beltsville, MD
Chien Wang, (301) 344-3128

Major pests of pecans in the South and Southwest can be controlled with little or no pesticide. Field tests of a new ARS biological control system has kept one of Georgia's largest pecan orchards practically free of insect pests--in part of the orchard without using any chemicals at all. The grower relied on lady beetles and lacewings, two natural predators of pecan aphids and mites. To encourage reproduction of these beneficial insects, all 1,700 acres of his orchard were planted in vetch and arrowleaf clover. During the first half of the 1985 growing season, the grower saved thousands of dollars in spraying costs. In late July, the appearance of one aphid species prompted him to spray all but 30 acres, but control by insects alone in the unsprayed section was at least as effective as on acres with sprayed trees.
Southeastern Tree and Nut Research Laboratory, Byron, GA
Lewis Tedders, (912) 956-5656

Discovery of the specific protein that causes sucrose to accumulate in plant cells could lead to genetically engineered crops with higher yields. Sucrose is an important factor in

regulating and determining plant growth and yield.
Plant Biochemistry and Bioregulation Laboratory, Logan, UT
Donald P. Briskin, (801) 750-3059

A beneficial insect, Bonnetia comta, can effectively parasitize black cutworm--a worm that infests and kills corn--but it arrives too late in the season under natural conditions to prevent damage. Large numbers of the larva, however, can easily be collected, stored, and placed around corn seedlings infested with black cutworm where they parasitize the cutworm and reduce damage to the corn.
Corn Insects Research Laboratory, Ankeny, IA.
Leslie C. Lewis; Joan E. Cossentine, (515) 964-6664

An improved method for growing tomato pollen in test tubes could improve the productivity of tomato plants. The method changes the ratio of nutrients in the agar the pollen is usually grown in. It can help scientists quickly find tomatoes that are tolerant to heat and could be used to find tolerance to other natural stresses, such as salt.
Biocommunication Chemistry Research, Albany, CA
Merle L. Weaver, (415) 486-3380

Peanut harvesting and grading can be improved using a new "impact blaster" and fiber optics--a reflected light-detector. The "impact blaster" is beginning to replace time-consuming hand scraping of peanut pods to find out when peanuts are mature enough to harvest. And using fiber optics may eventually replace the less accurate visual-method now used to find pods that are of better quality.
Southern Agriculture Energy Center, Tifton, GA
E. Jay Williams and Gordon E. Monroe, (912) 386-3348

New herbicides that can tell the difference between weeds and crops may eventually be developed from chemicals found in the fungus Alternaria. The microbial peptides--a chain of amino acids--can regulate growth and cause yellowing and death in sensitive weeds, such as johnsongrass (a serious pest of U.S. row crops), but not in corn and some other crops.
Southern Research Center, New Orleans, LA
J. Vince Edwards; Alan R. Lax, (504) 589-7591; 7593

Some trees can be protected from the air pollutant ozone by treating them with ethylenediurea (EDU)--an antioxidant chemical that reduces foliage damage. By injecting EDU into small stems of trees such as red maple, honeylocust, pin oak and sweetgum, rather than spraying it on the soil, the dosage can be regulated and the chemical can travel directly to where it is needed.
Nursery Crops Research, Delaware, OH
Bruce R. Roberts, (614) 363-1129

A unique research facility in Frederick, MD, allows ARS scientists to study foreign crop pathogens under the strictest quarantine conditions. When the U.S. Army abandoned its biological warfare research in 1970, ARS personnel took over the facility, which was designed for studying pathogens in isolation. Here ARS researchers plan defense strategies to deal with the potential invasion of a host of foreign crop diseases.
Plant Disease Research, Frederick, MD
William Dowler, (301) 663-7344

Membranes in plant cells, like those in animal cells, have ion channels that convey messages, scientists have discovered. The tube-shaped proteins control vital cell processes by shuttling ions into or out of a cell. Now scientists can look for chemicals that open or block the channels, possibly leading to compounds that increase growth and yield in crops or, in the case of weeds, stop growth.
Weed Science Laboratory, Beltsville, MD
Charles F. Mischke, (301) 344-3388

Using a growth regulator, scientists increased tolerance to stress in soybeans, snap beans, and apple seedlings. In laboratory tests, paclobutrazol protected these crops against injury after they were exposed to air pollution in the form of sulfur

dioxide, freezing, and heat stresses. These and other stress factors, including drought, can devastate a crop. Scientists hope the growth regulator can be made into a spray or put into the soil to protect these environmentally sensitive crops.
Plant Stress Laboratory, Beltsville, MD
Edward H. Lee, (301) 344-4528

A device to improve fuel efficiency and equipment performance in farm tractors has been developed. It automatically keeps an engine within 6 revolutions per minute of a given setting, despite changes in load conditions. Farmers usually have their engines at full throttle--a practice that is unnecessary and fuel--inefficient if the tractor is pulling a light load or no load. Now, they can set it at one speed, and, if, for example, the load becomes lighter, the engine will burn less fuel. By using the exact amount of fuel necessary at all times, farmers could save fuel and money.
Field Crops Mechanization Research Unit, Stoneville, MS
Lowrey A. Smith, (601) 686-9311

Sorghum growers do not need insecticides to control first-generation European corn borers, research shows. Farmers have traditionally applied insecticides at the beginning of a season because second-generation borers can devastate sorghum crops. But all of the 208 sorghum lines tested by ARS resisted leaf feeding by first-generation larvae. Although some larvae lived for a short time on leaves, the damage was not economically significant. Research continues to breed resistance to second-generation borers as well.
Corn Insects Research Unit, Ankeny, IA
Wilbur D. Guthrie, (515) 964-6664

Since decreasing alfalfa's drying time reduces loss of both crop and crop quality, scientists have devised a method that hastens drying time. Applying a solution containing potassium and sodium carbonates at mowing time is the cheapest way to make first crop alfalfa dry quickly, with less solution necessary at subsequent cuttings. The solution has also been shown to make hay more digestible and tasty to livestock, so animals may eat more and get more nutritional benefit from it.
Agricultural Engineering Department, East Lansing, MI
Clarence Rotz, (517) 353-1758

A new insecticide sprayer that will save farmers money and reduce pollution has been designed by ARS engineers. The new sprayer catches, in a collector box, insecticide that was sprayed off-target and recirculates it. In field tests, the sprayer cut the amount of insecticides applied on sweet corn by over 30%, yet provided as much protection as traditional nonrecirculating sprayers. The sprayer could also be used for other crops that are planted in rows and spaced apart.
Pesticide Application Technology Unit, Wooster, OH
D. L. Reichard, (216) 263-3869

Producers of hybrid cottonseed should rely on honey bees rather than native wild bees for pollination. Cottons used to make hybrid seeds, if pollinated by an adequate number of honey bees, yielded as much seed as nonhybrids. Two fields without honey bees, on the other hand, produced 79% and 91% fewer seeds than did fields with honey bees. Studies also show that distributing bee colonies on three sides of a field instead of one side only results in more seed production.
Carl Hayden Bee Research Center, Tucson, AZ
Gerald M. Loper, (602) 629-6140

Hydrilla, a fast-growing aquatic weed, may be controlled by exposing it to low-level lighting for one hour at night. The light interrupts the critical periods of darkness necessary for the plant to form tubers, the bulblike roots needed for hydrilla to reproduce. The control technique, which has worked in laboratory tests, is being tried in the Potomac River near Washington, D.C., in cooperation with the U.S. Army Corp of Engineers.
Aquatic Weeds Control Research Laboratory, Davis, CA
Lars W. J. Anderson, (916) 752-6260

ANIMAL PRODUCTION AND PROTECTION

A new method chemically couples foot-and-mouth disease virus and red blood cells. These viral-red blood cell combinations can be seen with the unaided eye and could be used to develop tests for foot-and-mouth disease virus and antibodies. Such tests would be ideal in countries that lack complex technical equipment required for current testing methods. The coupling methods could also be used to attach foot-and-mouth disease virus to other biological agents to develop more potent vaccines.
Plum Island Animal Disease Center, Greenport, NY
Richard C. Knudsen, (516) 323-2500

Certain strains of infectious bronchitis of chickens can now be controlled by vaccinating chicken embryos. This could save the poultry industry millions of dollars in labor, since present infectious bronchitis vaccines have to be injected into hatched chicks. Scientists modified a common strain of virus so that it would work in chicken embryos.
Poultry Research Laboratory, East Lansing, MI
Jagdev M. Sharma, (517) 337-6828

A new variant of Marek's disease virus that does not produce the tumors characteristic of the disease has been discovered. Next, scientists hope to isolate the genes responsible for producing tumors. By eliminating the tumor-causing gene, they expect to produce a new vaccine to combat the disease, which costs an estimated $156 million yearly in losses to farmers. Such knowledge could possibly lead to basic information about how viruses cause tumors in human cancer.
Regional Poultry Research Laboratory, East Lansing, MI
Robert F. Silva, (517) 337-6828

A recent survey of 3,000 cattle in 66 herds showed that about 1% of all cattle are carriers of the virus of bovine viral diarrhea (BVD), a leading cause of economic loss to the cattle industry. This large number of cattle that continuously carry and spread BVD to other herd members is a threat to the cattle industry. It is important that simple, efficient tests be developed so that these carriers be removed from cattle herds.
National Animal Disease Center, Ames, IA
Steven R. Bolin, (515) 239-8372

Two traits linked to the same gene on a sex-determining chromosome in chickens could have a far-reaching effect on the poultry industry. One such trait is growing feathers slowly, used to sex chicks at hatching. In most egg-laying strains, slow-feathering has been associated with decreased egg production, which in turn has been related to an increased occurrence of infectious leukosis viruses. In recent studies, scientists found that fast-feathering siblings did not produce a unique leukosis virus that was produced by slow-feathering chicks. This indicates that the leukosis virus is inherited only with the slow-feathering gene. Infection with this unique leukosis virus may lead to broad susceptibility to other leukosis viruses. Other research may lead to ways to prevent infectious avian leukosis.
Regional Poultry Research Laboratory, East Lansing, MI
Larry D. Bacon, (517) 337-6828

Genes from avian leukosis virus appear to have been successfully inserted into the reproductive cells of chickens for the first time. The researchers are now evaluating the chickens and their offspring to confirm the results. If successful, this technique opens the way to the use of a viral vector, or carrier, to insert other desirable genes--such as ones that control faster growth and disease resistance--into chickens. One more generation is needed to determine the stability of the inserted gene.
Regional Poultry Laboratory, East Lansing, MI
Lyman B. Crittenden, (517) 337-6828

Reproductive efficiency can be improved and costs reduced by altering the rearing and management system for gilts and boars. One study showed that young female pigs must be raised in groups of three or more to reach puberty earlier. No increase in sexual development problems was noted in groups as large as 27. Another study showed that young boars housed in groups of three performed twice as many successful matings as their individually penned counterparts.
Meat Animal Research Center, Clay Center, NE
Robert R. Oltjen, (402) 762-3241

For the first time, an identical copy of a gene from one species has been inserted into the fertilized egg of a food-producing animal and found to function. The gene is a replica of one found in humans that controls growth hormone. It was injected into fertilized pigs' eggs and proved active in a small percentage of these animals. The new technique may lead to the production of superior animals and new knowledge of genetic resistance to disease.
Reproduction Laboratory, Beltsville, MD
Vernon Pursel, (301) 344-2814

Researchers and producers have worked together to solve livestock reproduction problems nationally. Their cooperation, for example, has helped make turkey stud farms a success. Other achievements, such as more efficient scheduling of swine births and sheep-breeding seasons and controlling bovine brucellosis, may now be possible. Integrated Reproduction Management is a cooperative research effort of ARS, land-grant universities, industry groups, farmers, and USDA's Cooperative State Research Service and Extension Service to reduce livestock industry losses.
Beltsville Agricultural Research Center, Beltsville, MD
Roger J. Gerrits, (301) 344-3066
Daryl King, (301) 344-2774

Poor sexual performance in male pigs costs pork producers an estimated $2.5 million a year. ARS scientists are working to devise evaluation schemes to predict sexual drive in boars so that unfit ones go to market instead of gobbling up expensive feed without ever siring piglets. Hormones in unborn, growing and adult males may provide clues as to why up to 25% of males selected as breeding stock turn out to be sexually inadequate. Environment and penning arrangements also affect sexual performance.
U.S. Meat Animal Research Center, Clay Center, NE
J. Joe Ford, (402) 762-3241

Texel, a breed of white-faced sheep native to the Netherlands, is valued for its high yield of lean meat. These sheep will be bred for the first time in the United States by ARS researchers. The Tex l breed may be an excellent source of lean meat for producers to use, either straight-bred or crossed with domestic breeds. The sheep, imported from Finland and Denmark, will be in quarantine in Nebraska for 5 years. Thirty-one lambs have been born to ewes that were pregnant when they were brought to the United States.
Meat Animal Research Center, Clay Center, NE
Robert Oltjen, (402) 782-3241

Ear tags treated with the insecticide fenvalerate can almost completely control the biting fly, Culicoides variipennis, that transmits bluetongue disease to cattle, sheep, and goats. The insecticide was effective within a week after treating just one ear tag per animal. The tags can be used as part of a more complex pest control program. Tags are attached in the early or midsummer but are removed at the end of the season to prevent flies from developing resistance to the insecticide.
Arthropod-borne Animal Diseases Research, Denver, CO
Fred Holbrook, (303) 236-9354

A blood test for diagnosing progressive pneumonia, a disease that can affect up to 50% of U.S. sheep, can help ranchers select breeder sheep resistant to the disease. The disease is fatal once the animals become sick, but a low percentage of the animals actually show

the signs of the disease—weight loss, difficult breathing, and listlessness. Tests showed that Columbia sheep are more resistant to the virus than Border Leicester.
National Animal Disease Center, Ames, IA
Randall C. Cutlip, (515) 239-8544

A new way to extract and separate plasmid DNA is the first reliable method for differentiating strains of the bacterium (Moraxella bovis) that causes pinkeye in cattle. The genetic markers of the 200 strains that were identified could be valuable in tracing the spread of the infection. Vaccines could be improved since the strains may correlate with virulence and resistance.
National Animal Disease Center,
Ames, IA
Timothy J. McDonald, (515) 239-8200

Mosquito parasites, found to live inside microcrustaceans (small relatives of crawfish and crabs), may soon be bred and released in swamps and lakes. The discovery that the parasites live in microcrustaceans was made in Australia in a collaborative project with the ARS Gulf Coast Mosquito Research Laboratory in Louisiana. The parasites produce infectious spores that are released into the water, to be eaten by mosquito larvae. Some larvae become diseased and die before they can emerge as biting adults.
Gulf Coast Mosquito Research Laboratory,
Lake Charles, LA
Tokuo Fukuda, (318) 433-0696

Antibiotics in milk may someday be detected by the dairy industry with a simple test developed by ARS. Concerns that some dairy cattle are illegally treated with chloramphenicol (CAP) led to this experimental test, which costs only about 25 cents in materials and detects CAP in a milk sample. This test is just one of many developed by ARS to measure drugs in milk, urine, blood, tissue residues, and animal feeds.
Eastern Research Center,
Philadelphia, PA
Daniel P. Schwartz, (215) 233-6473

The yellow-fever mosquito transmits a virus disease called dengue that is currently in the Caribbean and Central America and now threatens the United States. However, another mosquito that harms neither man nor animals successfully provided biological control. An ARS pilot project proved so successful that the New Orleans mosquito control agency is rearing and releasing this predator to complement chemical treatments. Combined chemical and biological control was more effective than either method alone, wiping out 98% of the pests.
Mosquito Biology Research,
Gainesville, FL
Dave Dame, (904) 374-5930

Resistance to viral infections may result from studying the Major Histocompatiblity Complex (MHC) in swine genes. MHC genes regulate the immune system, determining if an animal will be resistant to disease. Scientists hope eventually to clone MHC genes and use embryo modification techniques to produce new strains of animals with the MHC genes associated with resistance. This may help prevent viral infections in pigs.
Helminthic Diseases Research,
Beltsville, MD
Joan Lunney, (301) 344-1768

Selenium-deficient diets in goats impair the ability of certain white blood cells to produce chemicals that control some of the body's defenses. This may lower the resistance of livestock to infections. Since livestock diets are often moderately deficient in selenium, this could have serious consequences for our meat supply. Scientists are seeking ways to remedy such deficiencies.
Parasite Research Laboratory,
Auburn, AL
P. H. Klesius, (205) 887-3741

A system for growing winter and summer annual forages to complement native range in the Southern Plains was found to increase beef production 100%. There was also a fourfold decrease in cost of production per pound of additional gain. Calculations show that these forage

systems have resulted in a 30% increase in land-use efficiency.
Range and Pasture Research,
Woodward, OK
Phillip L. Sims, (405) 256-7449

To combat Edwardsiella, a disease that costs the U.S. catfish industry $1.5 million annually, scientists have produced monoclonal antibodies that can be used to diagnose the condition. They hope also to use the antibodies in the development of a vaccine against this serious bacterial pathogen.
Regional Parasite Research Laboratory,
Auburn, AL
Phillip Klesius, (205) 826-4382

To ensure that chickens are adequately protected against disease, laboratories that do serum analyses after vaccination may need standard protocols to aid in the performance of these tests. ARS scientists conducted a study, using Newcastle disease as a model, in which identical serum samples were analyzed by 15 different labs. Some labs reported that the serum had very high concentrations of a Newcastle antibody, which would indicate good protection, while others showed very low levels, the sign of an unprotected chicken. To improve accuracy and reliability, scientists recommend that officials standardize procedure in analysis labs and begin a certification program.
Southeast Poultry Research Laboratory,
Athens, GA
C. W. Beard, (404) 546-3434

An optimum plan has been devised for using a preventative drug against babesiosis--a parasitic disease of cows and sheep. Babesiosis limits American exports to tropical countries where it is endemic, because the disease can kill 80% of the imported nonimmune animals. In lab tests, a carefully prescribed dose of the drug Imidocarb allows only mild infections upon contact with the disease, with solid immunity resulting. However, if too much of the drug is given, the animals fail to develop a natural immunity and are fully susceptible. Too little of the drug allows the infection to kill the animal. Knowing exactly how much of the drug animals need will increase exports by enabling ranchers to ship immune livestock to foreign countries.
Hemoparasitic Diseases Research Unit,
Pullman, WA
K. L. Kuttler, (509) 335-9665

More useful and efficient strains of Bacillus thuringiensis or BT, an economically important natural bacterium for insect control, may now be possible using recombinant DNA technology. First, however, the bacterium's cell wall had to be removed before the genetically engineered DNA could be added to the cell. Agency scientists identified and used commercially available enzymes for removing the walls. The next step is finding out how to induce bacterial cells to produce new cell walls. This research will facilitate development of improved industrial processes for producing, monitoring, and maintaining quality control of this valuable biological insecticide.
U.S. Livestock Insect Laboratory,
Kerrville, TX
Kevin Temeyer, (512) 257-3566

To reduce use and dependence on chemical nematocides for controlling roundworms in goats and other ruminants, new toxins from the bacterium Bacillus thuringiensis (BT) known to be lethal to this nematode are being investigated. So far, scientists have found the BT toxin acts like an ovicide, destroying the worm's eggs and developing larvae at its communicable stage. Each year, roundworms cause an estimated 5 to 10% loss in animal production from weight loss and death. This research may be extended to biological control of plant parasitic nematodes, like the soybean cyst nematode.
Parasite Research Laboratory,
Auburn, AL
Leon Bone, (202) 826-4382

"EXPERT" INFORMATION SYSTEMS

Costs and potential hazards of controlling weeds in irrigated crops will be lessened using models that predict the impact of agricultural chemicals on the environment. For example, predictions concerning the effect of soil-applied herbicides on weed population and groundwater contamination considers a welter of information--the current crop value, the herbicide cost, the amount applied, the cost of applying it, and the seed count and weed populations under alternative conditions--before recommending what action to take. Another model does similar crystal-balling for postemergence herbicides--first considering the actual weed population before recommending action. Scientists hope to minimize the use of herbicides while optimizing the value of the crop.
Sugarbeet Production Research, Fort Collins, CO
Ed Schweizer, (303) 482-7717

Three weather stations that cover 80% of Virginia's peanut-growing area give farmers facts needed to make fungicide-spraying decisions to control Cercospora leaf spot disease. The stations are part of Virginia's Agro-Environmental Monitoring System, a cooperative venture between ARS and Virginia Polytechnic Institute and the State University at Blacksburg, VA. The Virginia researchers have joined a recently formed national network of peanut researchers to develop an overall peanut-growth model to help farmers with other decisions such as when to apply other pesticides and when to irrigate.
Peanut Production, Diseases, and Harvesting Research Unit, Suffolk, VA
James L. Steele, (804) 657-6403

Infrared aerial photography may help save Rio Grande Valley cotton growers millions of dollars. Now inspectors can easily and cheaply detect cotton stalks harboring larvae of cotton's most serious pest, the boll weevil. By destroying stalks after harvest, weevils cannot overwinter to reproduce and cause heavy infestations in nearby fields the following season. In tests, farmers produced record yields with less pesticide, saving $25 to $30 million in one year. Decreasing the number of pesticide applications, which had averaged 10 per farmer, also helped spare beneficial insects that control Heliothis, another cotton pest.
Subtropical Crop Insects Research Unit, Weslaco, TX
K. R. Summy, (512) 968-3159

QUARTERLY REPORT
ON SELECTED RESEARCH PROJECTS
OF THE AGRICULTURAL RESEARCH SERVICE
U.S. Department of Agriculture
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ars Agricultural Research Service

CONSERVATION AND NATURAL RESOURCES RESEARCH

A Search is Underway for bacteria to help degrade and clean up pesticides and other unwanted chemicals in the environment. Now the technology exists to clone the genes in bacteria that can do this task. Once cloned, these genes could be transferred to other microorganisms to create a whole class of superdegraders.
Pesticide Degradation Laboratory, Beltsville, MD
Jeffrey Karns, (301) 344-2493.

Runoff and Soil Losses from corn grown on a Missouri claypan soil under no-till, conventional tillage, and reduced tillage were compared during a 6-year study. As expected, soil losses and runoff were least on no-till, followed by reduced and conventional tillage. Winter cover crops planted with no-till reduced both soil and water losses still more. The study also disclosed that crop management factors affect erosion and runoff under natural farming conditions more than would be predicted by the Universal Soil Loss Equation (USLE). The USLE is currently being modified by ARS researchers at West Lafayette, IN.
Watershed Research, Columbia, MO
Robert C. Wendt (314) 875-5331

Increasing the Amount of plant residues left on the soil surface makes no-till corn and soybeans use more native soil nitrogen. In a dryland experiment in eastern Nebraska, uptake of fertilizer nitrogen applied at planting also increased with increased quantity of residues, as did recovery of fertilizer nitrogen applied in earlier years. For corn, very little nitrogen immobilized in corn residues from the previous year's crop was used, but the new crop of soybeans took up almost all nitrogen in the previous year's residues.

Soil and Water Conservation Research Laboratory, Lincoln, NE.
James F. Power, (402) 472-1484

Protecting Groundwater from pesticides will be enhanced by revision of an ARS computer model called CREAMS (short for Chemicals, Runoff and Erosion from Agricultural Management Systems). The model can predict pesticides and farm-management practices that may contaminate groundwater. Such predictions along with identification of potential problems will lead to alternative pesticide use and management practices for high-risk areas. CREAMS may also pinpoint safe uses for pesticides that should be limited to certain situations, such as clay soils high above groundwater supplies.
Environmental Quality Research, Tifton, GA
Ralph A. Leonard, (912) 386-3514

CROP PRODUCTION AND PROTECTION RESEARCH

The Best Combination of beneficial insects and insecticides is being sought to control cotton pests. One of the most promising beneficial insects is a wasp, Microplitis croceipes, that is a parasite of bollworms and tobacco budworms. Each year, these two pests destroy more than 1 billion dollars in U.S. row crops. Studies show the beneficial wasp can survive several new insecticides used in cottonfields. In some tests, enough wasps survived to parasitize and kill half the remaining cotton pests, saving about 40 percent of the crop. In closely related research, scientists have perfected a way to tag wasps, making it possible to track them in the wild and so devise more efficient ways to use them as biocontrol agents. This successful biological control research has sparked related studies at Gainesville, FL; Tifton, GA; Columbia, MO; and College Station, TX.
Southern Field Crop Insect Management Laboratory, Stoneville, MS
Edgar G. King, (601) 686-2311

Lowering Moisture by Freeze-Drying seeds markedly improved the storage life of onion, pepper, and parsley seeds at warm temperatures. Studies showed that air-drying followed by freeze-drying lengthened seed storability and viability in marketing channels. This makes seeds easier to transport in tropical areas, lowers energy cost for air-conditioning, and preserves germplasm better by reducing the need to grow new plants to get new seeds.
Seed Research Laboratory, Beltsville, MD
Lowell W. Woodstock, (301) 344-2491

Plants Tolerant to Drought or salty soil are closer to being engineered genetically. A new method has been developed to remove chromosomes from one plant cell, inject them into another, with genes in the inserted chromosomes functioning properly.
Florist and Nursery Crops Laboratory, Beltsville, MD
Robert Griesbach, (301) 344-3574

The Discovery that a fungus of berries mimics flowers to "spread" itself could help scientists control mummy-berry disease. It is caused by the Monilinia fungus and can cut blueberry yields by 80 percent. Now scientists know that the disease survives by "tricking" bees into spreading it. Fungal spores, after they infect blueberry leaves, cause the leaves to reflect ultraviolet light and give off the scent of sugars--both characteristics of flowers. A bee flies by, picks up the signals, and, reacting to the leaf as if it were a flower, stops to feed on sugars. When it goes to the next "real" blueberry flower, the bee brings with it--on its tongue and legs--the spores of the fungus to infect the flower, thereby perpetuating the disease. This phenomenon, called floral mimicry, has been unknown until now.
Beneficial Insect Introduction Laboratory/Mycology Laboratory, Beltsville, MD
Suzanne Batra, (301) 344-2384/Lekh Batra, (301) 344-2317

Pecans Can Be Grown more easily and cheaply with an experimental growth regulator, scientists have found. Paclobutrazol, now used on apple and other fruit trees, makes pecan trees into semidwarf trees without decreasing the number of pecans they produce. The smaller trees will save farmers money because they require less equipment for maintenance and are easier to prune, spray, and harvest.
Southeastern Fruit and Tree Nut Research Laboratory, Byron, GA
J. Wendell Snow, (912) 956-5656

Female Caribbean Fruit Flies choose their mates from courtship calls sung by males. Females prefer larger males whose song gives away their size--the larger the male, the shorter the interval between the tones in his mating call. Scientists believe that larger males are healthier and therefore sing a more vigorous song, which becomes constant and louder during mating. The volume during mating alerts females to the size of their mates. A male perceived to be too small will be rejected by the female. Knowing what kind of males the females find attractive will help scientists release stronger sterile males into the wild, resulting in a smaller fruit fly population.
Insect Attractants, Behavior, and Basic Biology Research Laboratory, Gainesville, FL
John Sivinski, (904) 947-7726

A Method for Growing better citrus fruit has been developed. Using gamma radiation, scientists can almost eliminate seeds from some of the tastiest but "seediest" varieties of citrus fruit. The 'Duncan' white grapefruit, the 'Pineapple' orange and the 'Foster' red grapefruit get high marks for flavor, aroma, color, juiciness, and size. But they also have too many seeds to be sold as fresh fruit. By irradiating seeds of these fruits before planting, citrus farmers can grow trees that yield commercially seedless fruit (fruits with fewer than 10 seeds) with excellent taste.
U.S. Horticultural Research Laboratory, Orlando, FL
C. Jack Hearn, (305) 898-6791

Control of Golden Nematodes, or eelworms, may be possible by synthesizing the chemicals in potato roots that trigger the hatching of this pest's eggs. Eggs may lie dormant in the soil for years until the chemicals, called exudate, ooze out of potato roots. By applying synthesized exudate to unplanted fields, farmers could "trick" eggs into hatching, starve the young worms, and reduce crop losses, which can reach 10 percent. Research to develop the synthetic hatching signals continues.
Nematode Research, Ithaca, NY
Bill Brodie, (607) 256-3106

Scientists Identified Immunity to the tomato ringspot virus in 13 varieties of strawberries when they tested the 52 most popular natives in the United States. Knowing which ones show immunity will help breeders develop varieties that resist the damaging disease altogether.
Horticultural Crops Research, Corvallis, OR
Richard H. Converse, (503) 754-3451/
Francis Lawrence, (503) 757-4623

A Method to Detect dwarf bunt disease in wheat may help U.S. exports. China and other countries are trying to prevent the disease from crossing their borders, and the new test will quickly and easily identify disease-free grain. Using a special microscope, scientists check for fluorescence at certain spots on the fungus spores--spots that identify the disease because they are distinctive to dwarf bunt fungus.
Forage Seed and Cereal Research Unit, Corvallis, OR
Virginia O. Stockwell, (503) 754-3451

Control of the Colorado Potato Beetle may be possible with a fungus, Beauveria bassiana. When scientists sprayed the fungus on potato plots, the treated plots yielded 9,800 pounds per acre, 5.5 times more marketable potatoes than did untreated ones.
Yakima Agricultural Research Laboratory, Yakima, WA
K. Duane Biever, (509) 575-5963

Double-Cropped Soybeans planted in wheat straw are sometimes stunted and chlorotic when grown in heavy-textured soils of the Mississippi Delta. Burning the straw gets rid of chlorosis, but burning also eliminates the soil conservation benefits of leaving residue on the ground. In their search for the cause of the chlorosis, which may involve a chemical released when wheat straw decomposes, scientists have found that drilling 25 pounds of nitrogen per acre beside young soybean plants overcomes the chlorosis.
Crop Science Research Laboratory, Mississippi State, MS
Joe Sanford and Jim Hairston, (601) 325-2085

A Newly Discovered Variety of gamagrass, a tall, coarse grass valuable for forage, has one or two genes that allow it to produce 20 times more seed than other gamagrasses. Since the plant is a wild relative of corn, the genes may enable plant breeders to produce higher yielding varieties of corn.
Southern Plains Range Research Station, Woodward, OK
Chester L. Dewald, (405) 256-7449

Farmers May One Day Control rootworm with less pesticide spraying now that seven odors given off by the roots of corn plants have been identified. The odors help rootworms locate their target and so help farmers estimate just how many worms are present before any chemicals are applied. Odors might also be changed or other compounds added to the soil to "confuse" worms.
Biocommunications Chemistry Research Unit, Albany, CA
Ron Buttery, (415) 486-3322

Most Early Deaths of melon seedlings from heat stress--a nationwide problem--can be stopped with two preplanting procedures. First, farmers should wait until the first true leaf is more than 10 days old before they transplant. Second, they could "heat-condition" seedlings with true leaves by warming them at 35 degrees C for at least 2 hours before transplanting.
Agricultural Products Quality Research, Weslaco, TX
Gene Lester, (512) 968-7546

Fungi That Provide a biological link between soil and plant by carrying minerals and water via tiny threads into roots are also known to convey herbicides. The fungi penetrate roots, living with the plant in a symbiotic relationship called mycorrhizae. For the first time, they have been shown to affect a plant's absorption of atrazine by enhancing the amount of intake by a plant. Scientists may someday exploit this phenomenon by using mycorrhizae to boost herbicide uptake by weeds, thereby cutting the amount needed.
Soil and Water Conservation Research, Lincoln, NE
Jim Ellis, (402) 472-1514

A Quick Test to detect pesticide residues in bees has been developed. The test, which identifies presence and levels of pesticide chemicals called organophosphates, is easier to conduct than previous ones and takes less time. Honey bees, which help produce 30 percent of our food, have been dying in large numbers, and 60 percent of the deaths are due to organophosphate poisoning. Knowing how these organophosphates affect the bees will help scientists make responsible recommendations for their use.
Honey Bee Pesticides/Disease Research, Laramie, WY
Jack Harvey, (307) 766-3381

Extracts of the Neem Tree are effective insecticides for more than 80 major insect pests. Leafminer flies, cockroaches, and the Colorado potato beetle are among the many pests controlled by extracts from the tropical tree. Now ARS scientists have found that neem will provide safe and relatively cheap control for the sweetpotato whitefly. This pest, which has developed resistance to many insecticides, cost farmers of vegetables, melons, and field crops over 100 million dollars in retail sales in 1981 alone.
Boyden Fruit and Vegetable Insect Research Unit, Riverside, CA
Donald L. Coudriet, (714) 787-3828

Sunflowers, Black Walnuts, and sorghum are among the many plants that produce chemicals from their root systems that inhibit the growth of other plants, including weeds. Recent laboratory tests have shown that populations of such serious weed pests as velvetleaf, pigweed, and lambsquarters decline sharply when planted alongside germinating sorghum. Current research on these allelopathic chemicals, which include a broad class of compounds called phenolics, could lead to (1) breeding crops with increased ability to manufacture these substances and (2) synthesizing the chemicals to produce herbicides that can be used without risk to the environment.
Eastern Regional Research Center, Philadelphia, PA
Donald Bills, (215) 233-6580

ANIMAL PRODUCTION AND PROTECTION RESEARCH

Livestock Producers may someday be able to choose male or female offspring, thanks to a technique that has been developed to sort out the X and Y sperm in animals. The technique uses a laser beam to separate chromosomes sexually and should dramatically shorten the time required for genetic improvements.
Reproduction Laboratory, Beltsville, MD
Larry Johnson, (301) 344-2809

Safer Chemicals to kill imported fire ants are on the way. Two new products containing compounds tested by ARS--carbamate and avermectin--are expected on the market by yearend. Both break down quickly in the environment. ARS has also discovered a group of compounds--fluorinated sulfonamides--that will kill fire ants over a longer time. Ants bring the poisoned bait back to their nests and share it with others through communal feeding. These promising insecticides are being tested in laboratory and field.
Insects Affecting Man and Animals Research Laboratory, Gainesville, FL
Robert K. Vander Meer, (904) 737-6701, Ext. 356

A First Step toward a vaccine to protect cattle from the larvae of the common cattle grub promises to give yearlings the same level of resistance to the pest that older cattle get from actual exposure to natural infestations. Once cattle are exposed to the parasitic fly, their immune systems develop resistance to the pest by producing antibodies. Scientists are trying to isolate the protein that causes this antibody response. Once isolated, the protein could then be cloned, using bacteria and recombinant DNA techniques to make a vaccine. Presently, cattle are treated with pesticides--an expensive, time-consuming method that can leave cattle sick while it is working.
Biting Fly and Cattle Grub Research, Kerrville, TX
John H. Pruett, Jr., (512) 257-3566

About One Percent of newborn pigs have birth defects, with one-quarter of them traced to genetic or environmental origins. To assist swine producers in determining whether a defect is caused by either culprit, scientists have put together a fact sheet that describes 25 genetic abnormalities and prescribes procedures known to reduce their incidence. Copies can be purchased from Purdue University Cooperative Extension Service, West Lafayette, IN. If the frequency of pigs born with birth defects could be decreased to one half, producers could increase their income by 50 million dollars.
Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, NE
Lawrence D. Young, (402) 762-3241

Yearling Bulls from first-calf dams may have testes that are less developed than those of bulls from older dams. Young bulls with large testes may produce more sperm, reach puberty sooner, and be better breeders. Studies show that beef breeders should also consider differences among breeds and heritabilities, as well as the relationships between testes size and age and body weight, in selective breeding programs.
Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, NE
Donald D. Lunstra, (402) 762-3241

Measurement of Growth and development of testes of eight breeds of boars indicated that those of Large White and Landrace were larger. Selecting boars within breeds with larger testes may result in genetic increases in growth rate and animals with thicker backfat. Correlations between testicular development and growth rate were greater for older than for younger boars. Such research could help pork producers select boars with increased fertility, which may produce daughters with increased reproductive ability.
Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, NE
Lawrence D. Young, (402) 762-3241

To Reduce Loss of sheep to coyotes, scientists are testing attractants to lure the predators away from flocks. The lures are derived from rancid food and coyote urine, and one lure has been patented by ARS. Negotiations are underway for exclusive public licensing to an interested manufacturer.
Biocommunication Chemistry Research Unit, Albany, CA
Roy Teranishi, (415) 486-3161

To Cut Feed Cost for cows by as much as 60 percent, farmers can use alfalfa cubes as a protein supplement. Traditional supplements, cottonseed meal and soybean meal, are typically far more expensive, and alfalfa helps cows maintain weight and condition just as well as the other supplements do.
Fort Keogh Livestock and Range Research Laboratory, Miles City, MT
Don Adams, (406) 232-4970

A Reduction in the annual 150 million dollar loss to farmers because of ruminant parasite diseases may now be possible. Scientists have found a feeding stimulant that makes nematodes, grown in the lab, ingest four to five times the amount of anthelmintic (antiworm) drug they normally do. If worms could be tricked into eating greater amounts of the drug inside animals, farmers would need less to control these diseases.
Regional Parasite Research Laboratory, Auburn, AL
Leon Bone, (205) 887-3741

CROP UTILIZATION AND POSTHARVEST TECHNOLOGY RESEARCH

Repellents for German Cockroaches were 100-percent effective for up to a month in keeping the notorious pests out of places where they live and breed--boxes, ovens, and cabinets. Agency scientists who synthesized the repellents are seeking three patents for a number of compounds that are related to the well-known biting-insect repellent, deet. They are also lab-testing the new repellents against other, outdoor cockroaches.
Insects Affecting Man and Animals Laboratory, Gainesville, FL
Richard S. Patterson, (904) 374-5910

New Corn-Grinding System saves energy and boosts poultry productivity. By using rollermills instead of hammermills to grind corn for chicken feed, poultry producers can lower their energy cost by 15 percent for grinding and significantly increase by 5 percent broiler weight gains during the first 3 weeks of growth. Grinding is the second largest user of energy in feed preparation for poultry.
Poultry Mechanization Research, Mississippi State, MS
Floyd N. Reece, (601) 323-2230

Seeds Can Be Safely Stored in ammonia-refrigerated warehouses without risk of accidental leakage affecting germination. Ammonia is known to be toxic to germinating seeds, but its effect on dry seeds was previously unknown. For the first time, studies show that after a leak, gas levels encountered by soybean, corn, and peanut seeds stored in a warehouse are unlikely to injure them. This is good news for the American seed industry, which uses this method to store large numbers of seeds.
Seed Research Laboratory, Beltsville, MD
Lowell W. Woodstock, (301) 344-2491

To Maximize Profits and minimize fiber damage for each bale of cotton, a computer model of the ginning system was used to develop the best ginning recommendations. Results of the computer run showed that a processor would have only four possible processing sequences for optimal cleaning and drying of bales. This knowledge will allow a ginner to select one of these four sequences after estimating initial amounts of foreign matter and moisture in the cotton. Such systems, if used, could net cotton growers an estimated $20 more per bale--about 6 percent of its value.
U.S. Cotton Ginning Laboratory, Stoneville, MS
W. Stanley Anthony, (601) 686-2385

Hydrochilling, A New Method of quickly lowering temperatures of freshly slaughtered carcasses, could save time, money, refrigerater space, and energy. Spraying packaged meat with a safe refrigerant at 15°F cools the meat three to five times faster than conventional methods that take 24 hours or longer--using air to cool hot carcasses. This allows meat to be chilled, packaged, and shipped the same day the animal is slaughtered. Hydrochilling, along with quick handling and processing, like vacuum packaging, could make it practical to export fresh variety meats, such as livers, hearts, kidneys, and tongues, and so help expand lucrative U.S. markets in Europe for these products by increasing their shelf life 2 to 2-1/2 times.
Meat Processing and Marketing Research, College Station, TX
Raymond A.Stermer, (409) 260-9248

A Computer Program to help engineers plan and alter complex food processing systems is being developed at the Eastern Research Center. A complete potato-flake pilot plant, built when dehydrated mashed potatoes were first developed at the lab in the 1950's, recently went back into operation to provide prototype data for the computer simulation program. The simulator can already be used to "try out" a seemingly endless variety of modifications to potato-flake processing plants, with the aim of lowering costs or improving product quality. The simulator will eventually be able to answer technical

questions about the design of many different kinds of food-processing systems.
Eastern Research Center, Philadelphia, PA
Michael J. Kozempel, (215) 233-6588
Raymond A. Stermer, (409) 260-9248

Losses Between Harvest and consumer may be eliminated with a computer program for producers and processors. For example, scientists analyzed data on the number of potatoes lost and the amount of energy used at each step in the production of french fries, potato chips, and so on. By accounting for the energy each step required, they were able to assess more accurately the most profitable use for the crop. The program can be used to make similar analyses for other food products.
East Grand Forks, MN
Lewis A. Schaper, (218) 783-0344

Raw Materials for Plastics, resins, and other products can be taken from sumac, a common American shrub. In particular, one group of chemicals found in sumac--polyphenols--can be used in several areas of industry. In addition to forming plastic, polyphenols can help make slow-release drugs, pesticides, and solvents. The chemicals, acting as molecular "glue," help slow down release of substances into the environment. Several polyphenols also contain tannins, which combine with hides to form leather. Farmers could grow, cut, and bale the sumac shrub should further research confirm these preliminary results.
Germplasm Resources Laboratory, Beltsville, MD
T. Austin Campbell, (301) 344-3638

Lipase Enzymes, giant molecules that are generated by some living things to degrade the fats and oils they ingest, also have the ability to alter certain fats and oils in the laboratory, transforming one kind of fat into another. In one series of experiments, beef tallow, a surplus item in the United States, was changed by the catalytic action of a lipase enzyme into cocoa butter. Today an ARS biochemist hopes to produce and isolate large quantities of a lipase enzyme from fungi, using modern techniques of genetic engineering. Lipase enzymes may hold the key to transforming fats and oils that are plentiful into other oils that are currently scarce or expensive.
Eastern Research Center, Philadelphia, PA
Phil Sonnet and Michael J. Haas, (215) 233-6412

New Top Coatings for Leather can be applied in a variety of colors more quickly and with less energy cost than with conventional methods, which require the slow evaporation of solvents in coatings in 100-foot-long drying ovens. Now, instead of evaporating, the solvents react chemically and become part of the coating, avoiding air pollution and waste of chemicals. The reaction occurs in seconds when the coated leather is exposed to electron beams or to ultraviolet light. The new coatings produce leather with excellent physical properties, including improved abrasion resistance.
Eastern Research Center, Philadelphia, PA
David C. Bailey, (215) 233-6515

HUMAN NUTRITION RESEARCH

A Newly Discovered Defective Gene could prove invaluable in identifying people genetically predisposed to develop coronary heart disease. This could lead to preventative diets for high-risk individuals. The gene codes for a major protein component of high-density lipoproteins (HDL)--the "good" lipoproteins that move cholesterol out of artery walls. The gene abnormality was identified in about 60 percent of subjects with genetic HDL deficiency, 33 percent of patients with premature coronary artery disease, and 4 percent of normal subjects.
USDA Human Nutrition Research Center on Aging at Tufts University, Boston, MA
Ernst Schaefer, (617) 956-0393

A Mother's Milk, depending on where she lives, can protect her baby from locally prevalent harmful bacteria. It is not clear, however, whether infants acquire immunity to these bacteria passively from her milk or whether unidentified agents or conditions in the milk trigger their immune systems. Studies underway to answer this question will use stable isotopes in mother's milk fed to infants to trace the exact source of this necessary immunity. Results may also shed light on why children of malnourished mothers don't grow as fast as those whose mothers are well nourished.
USDA Children's Nutrition Research Center at Baylor College of Medicine, Houston, TX
Cutberto Garza, (713) 799-6004

Taurine, An Amino Acid common to mammals, has no demonstrated function, but in some species, its deficiency can lead to loss of sight. Whether taurine is essential to humans is not known, but recently, it has been added to baby formulas as a precaution against possible deficiencies. Now, for the first time, direct evidence of taurine biosynthesis in man has been obtained using a heavy isotope of oxygen ($_{18}O$) as a tracer. After subjects breathed pure $_{18}O$, taurine containing the tracer appeared in the urine. Studies are underway to determine whether infants, too, can make adequate amounts of taurine or whether this ability appears during maturation.
USDA Children's Nutrition Research Center at Baylor College of Medicine, Houston, TX
Peter D. Klein, (713) 799-6000

A 6-Month Study on Folic Acid, part of the vitamin B complex, indicates that healthy males need only 200 micrograms per day--or half the Recommended Dietary Allowance (RDA). This amount can be ingested through normal dietary intake. The study also showed that supplements of folic acid can interfere with the absorption of zinc if the amount of this essential mineral in the diet is marginal--about one-fourth the RDA of 15 milligrams. However, supplements of folic acid do not significantly affect the absorption of iron or copper.
Grand Forks Human Nutrition Research Center, Grand Forks, ND
David Milne, (701) 795-8424

Low-Fat Diets, accompanied by an increase in polyunsaturated fats, may stimulate kidneys to eliminate excess sodium and potassium, thereby lowering a person's blood pressure, studies show. This new information may indicate why blood pressure drops when people alter their intake of fat, as well as point to new ideas about ways to prevent hypertension with proper diet.
Western Human Nutrition Research Center, San Francisco, CA
Jack Iacono, (415) 556-9697

People on High-Fiber Diets should increase their intake of calcium and magnesium to maintain proper balance of these minerals, a human study disclosed. But 40 grams of fiber per day did not interfere with the balance of zinc, copper, manganese, or iron when the carbohydrate source was starch. When starch was replaced with sugars (primarily sucrose and fructose), however, the absorption of copper and manganese decreased, indicating that sugars can interfere with the bioavailability of certain minerals.
Beltsville Human Nutrition Research Center, Beltsville, MD
Sheldon Reiser, (301) 344-2396

Adequate Dietary Copper prevented blood clots in the heart and other serious cardiovascular damage in mice on a high-fat diet. Such diets were found to induce severe damage to the heart and vessels 20 years ago, leading to current concern over the fat content of human diets. The addition of copper to high-fat diets prevented the severe damage attributed to fat in the earlier studies.
Grand Forks Human Nutrition Research Center, Grand Forks, ND
Leslie Klevay, (701) 775-8353

High Sugar Intake may increase the risk for adult-onset diabetes in the 15 percent of the U.S. population

genetically predisposed to sugar sensitivity. Sugar-sensitive people, many of whom are unaware of it, show higher-than-normal levels of serum insulin and triglicerides. An inbred line of rats having many of the same metabolic characteristics as sugar-sensitive people is being used to study adult-onset diabetes, the most common type of diabetes. Sugar was five times more effective than starch in inducing diabetes in these rats.
Beltsville Human Nutrition Research Center, Beltsville, MD
Otho E. Michaelis, (301) 344-2093

Total Body Fat can now be estimated by a quick and easy method that uses short wavelengths of infrared light to read fat at key spots on the body. The method, called IRI for infrared interactance, could lead to portable machines for doctors' offices, hospitals, sports teams, and even the public to keep tabs on physical fitness. Tests show IRI is faster, easier, and more accurate than skinfold measurements--the most common method used today. IRI also compared favorably with the accepted standards for estimating body fat, which are time consuming and restricted to the laboratory.
Beltsville Human Nutrition Research Center, Beltsville, MD
Joan Conway, (301) 344-2977

Carbohydrate Intolerance, a serious type of malnutrition in very young infants worldwide, is characterized by continuous weight loss followed by chronic diarrhea aggravated by carbohydrates in the diet. These infants are unable to absorb even simple sugars through their gastrointestinal tract and will die if not treated. Studies on hospitalized infants with carbohydrate intolerance and less severe forms of diarrhea suggest that chronic malnutrition, combined with a rotavirus infection, contributes to the development of carbohydrate intolerance.
USDA Children's Nutrition Research Center at Baylor College of Medicine, Houston, TX
Veda Nichols, (713) 799-6179

Certain Foods Block Zinc Uptake. Phytate, a natural substance found in large quantities in whole-grain products, green beans, potatoes, and other common foods, may inhibit the body's ability to absorb zinc, an essential nutrient. In a 2-month study, young men with diets high in phytate absorbed only one-half as much zinc as when they were put on diets free of phytate. The results suggest that high levels of phytate in the diet could lead to zinc deficiency, even for individuals who take the Recommended Dietary Allowance of 15 milligrams of zinc each day.
Western Human Nutrition Research Center, San Francisco, CA
Judith Turnland, (415) 486-3487

EXPERT SYSTEMS RESEARCH

The ARS National Soil Erosion Lab is working with five State experiment stations--in Iowa, Missouri, Illinois, Indiana, and Ohio--on a Computerized Production System. Within the next 2 years, modules in the system will be available to Midwestern farmers for use in their own personal computers. Objective of the expert system will be to help farmers take steps to assure adequate return on their investment, while conserving and protecting soil and water at the same time.
National Soil Erosion Lab, West Lafayette, IN
Harold Barrows, (317) 494-8673

New-Wave Computers expertly reduce and recognize patterns from a welter of information available on cotton plants. These computers can handle several knowledge systems or models to analyze computer data swiftly and efficiently. Such systems will enable cotton growers to increase the growth and productivity of their crops by choosing the best possible management system. Part of the system is already online for farmers to access with personal computers. With the help of the Cotton Foundation and the support of industry, a prototype test of on-farm crop simulation is already underway. Within a year, farmers will be checking out various combinations of management options that

help avoid nitrogen and water stress, advise which pesticide to apply and when, and determine when to harvest their crop. When completed, COMAX (Crop Management Expert Systems), which was developed by ARS in cooperation with Clemson and Mississippi State Universities, will help growers better manage the Nation's 14 million acres of cotton and shave annual crop losses by 10 percent or $500 million.
The Robey Wentworth Harned Lab,
Mississippi State, MS
Donald N. Baker, (601) 323-2230

QUARTERLY REPORT ON SELECTED RESEARCH PROJECTS
OF THE AGRICULTURAL RESEARCH SERVICE
U.S. Department of Agriculture
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CONSERVATION AND NATURAL RESOURCES RESEARCH

GROUND WATER POLLUTION caused by applying dissolved chemicals at the surface can occur much more quickly than previously suspected. New research indicates that water moves down through wet soils twice as fast as predicted by theoretical models. In drier soils, the rate is 4-5 times faster than previously thought. Some chemicals, however, may break down on the way.
U.S. Water Conservation Lab., Phoenix, AZ
Herman Bouwer, (602) 261-4356

COLD SOILS CAN REDUCE the amounts of zinc and other trace minerals that people get in their diets. New studies show plant roots do not penetrate deeply enough into chilled soils to absorb sufficient minerals. One solution to the problem could be boosting the zinc and phosphorus content of fertilizers for spring and fall applications, perhaps with special fertilizer formulas tailored to climatic conditions in each ecological zone.
U.S. Plant, Soil, and Nutrition Lab., Ithaca, NY
David Grunes, (607) 256-3003

A ONE-TIME APPLICATION of a soluble chemical can affect ground water for several years. When potassium bromide, a tracer, was applied at a rate often used for nitrogen fertilizer on two 3-acre-pasture watersheds, ground water samples from springs supplied by the watersheds showed peak bromide concentrations 21 to 24 months after application. After 45 months, there still was no meaningful decrease.
North Appalachian Exp. Watershed Res. Lab., Coshocton, OH
Lloyd B. Owens, (614) 545-6349

SOIL EROSION REDUCES FERTILITY, even in the deep loess soils of the Palouse in the Pacific Northwest. An ARS soil scientist finds that, about 15 inches deep, the soils become calcareous. As soil washes away, reduced levels of organic matter cause nitrogen to drop, and phosphorus levels 6-12 inches deep are half again lower than in the top 6 inches of soil. Eroded soils also store less moisture.
Soil Mgt. and Water Quality Research Lab., Kimberly, ID
Truman W. Massee, (208) 423-5582

SORDAN, A FORAGE HYBRID OF SORGHUM AND SUDANGRASS, may have the ability to reclaim unproductive, salt-bound soils. An ARS scientist has discovered that the roots of Sordan give off more than twice as much carbon dioxide as most other plants. In moist soils, the high CO_2 levels lower the pH enough to dissolve the lime in the soil. The dissolved lime, in turn, replaces unwanted sodium attached to the clay, and the sodium can then be leached out by irrigation. Expensive applications of gypsum would be unnecessary. Testing the theory, a rancher planted Sordan on a totally unproductive salt-bound field and subsequently harvested 20 tons of forage per acre. Tests continue of this promising hybrid.
Snake River Conservation Research Center, Kimberly, ID

CROP PRODUCTION AND PROTECTION RESEARCH

IN AN EFFORT TO LOCATE specific sugarbeet genes, ARS scientists have discovered that establishing gene locations on chromosomes can be done much more quickly, efficiently, and precisely by using trisomic plants—those having a specific extra chromosome. They have now developed all nine possible trisomic types of sugarbeets and described them, paving the way for precise genetic engineering.
Crops Res. Lab., Fort Collins, CO
Richard J. Hecker, (303) 482-7717

A ONE-MINUTE TEST for rubber, resin, and moisture content of guayule, a shrub native to the southwestern United States, has been developed to replace the current slow, tedious process. Guayule is being studied as a potential source of domestic rubber. The new analysis method uses near-infrared reflectance spectroscopy with computer assistance.
Northern Regional Research Center, Peoria, IL
G. W. Hamerstrand, (309) 685-4011, Ext. 536

WHILE LITTLE BLUESTEM IS COMMON on tallgrass prairies, it is less palatable to cattle than other dominant tallgrasses. ARS scientists in Oklahoma have found that prescribed burning fails to stimulate the growth of little bluestem as it does such preferred grasses as big bluestem and indiangrass. This means that fire can be used to produce a more favorable composition of grass species on prairie grazing lands.
Range and Pasture Research Unit, Woodward, OK
Phillip L. Sims, (405) 256-7449

THE "GREENHOUSE EFFECT" of carbon dioxide may not be all bad. A number of scientists have predicted that rising levels of CO_2 in the atmosphere will eventually raise global temperatures enough to melt polar ice caps, cause sea levels to rise, and ultimately flood coastal cities. But not all scientists agree. An ARS physicist points out that actual temperature increases to date in the extreme northern latitudes are substantially below the projections of pessimistic climate modelers. He also observes that predicted higher CO_2 levels, while having no detrimental effect on people or animals, would significantly improve plant productivity by increasing photosynthetic activity, as laboratory tests have shown.
Soil, Plant and Atmosphere Systems Lab., Phoenix, AZ
Sherwood Idso, (602) 261-4356

A NEW BREEDING TECHNIQUE that makes use of early flowering lettuce plants can cut in half the time needed to develop disease-resistant varieties. Early flowering plants are commercially useless, since they skip the vegetative stage, but an ARS scientist has found that he can use the early flowering genes to carry more desirable genes. He was able, for example, to insert genes for mosaic resistance into a non-resistant lettuce variety in 375 days, compared to 750 days using normal lettuce. He believes the technique can be applied to other plants with early flowering varieties, including peas, soybeans, beans, spring wheat, rice, and sugarbeets.
U.S. Agricultural Research Sta., Salinas, CA
E. J. Ryder, (408) 443-2253

CROP PRODUCTION AND PROTECTION RESEARCH (continued)

WEEDS THAT SURVIVE herbicide spraying can be mopped up with a new tractor attachment called a rotary herbicide wiper. A spinning disk wipes (instead of sprays) a herbicide directly onto weeds growing beneath the crops. The method avoids herbicide drift and increases operator safety.
Appalachian Fruit Research Station, Kearneysville, WV
William Welker, Jr., (304) 725-3451

THE MYSTERY OF STUNTED SEEDLINGS and uneven stands in tree nurseries has been solved by ARS scientists in Oregon, who have shown that inoculation with certain fungi enhances growth of at least 4 species of conifers--Western red cedar, incense cedar, coast redwood, and giant sequoia. Conifer seedlings were treated with 3 species of vesicular-arbuscular mycorrhizal (VAM) fungi, which had inadvertently been killed during routine soil fumigation in the greenhouse. Treatment not only increased biomass, but it also enhanced seedling uniformity and size in all 4 species. Fumigants are now recommended that will leave unharmed the VAM fungi occurring naturally in the soil.
Horticultural Crops Research Unit, Corvallis, OR
Robert G. Linderman, (503) 757-4544

MOLECULAR BIOCHEMICAL TECHNIQUES have determined that chloroplast DNA in soybeans is inherited only from the female parent. Chloroplast DNA is the site that contains the information for photosynthesis. This research has academic significance in understanding the evolutionary history of the cultivated soybean and practical application in breeding programs where it is necessary to transfer desirable traits from wild species.
Cereal & Soybean Improvement Res., Ames, Iowa 50011
Reid Palmer, (515) 294-7378

THE TARNISHED PLANT BUG, until recently considered but a minor pest of cotton in the Mid-South, is now known to cause considerable damage during the bug's peak months of May and June. In tests in 1981-83, ARS researchers applied aldicarb, a systemic insecticide, to cotton at planting. As a result, they realized yield increases of as much as 20 percent. In 1984, several foliar insecticides applied weekly in June successfully controlled plant bug populations, while uncontrolled populations reduced yields as much as 40 percent and delayed harvest 2 weeks. Environmental hazards were kept to a minimum during applications. Meanwhile, researchers have found a mite that is a parasite and predator of the plant bug.
Southern Field Crop Insect Mgt. Lab., Stoneville, MS
E. G. King, (601) 686-2231

CROP PRODUCTION AND PROTECTION RESEARCH (continued)

GETTING THE BEST RESULTS from pesticides sprayed on plants depends on keeping the droplets on the leaves. An ARS researcher uses high-speed motion pictures to show that large portions of droplets sprayed on some plants rebound as many as six times after impact. He is currently testing droplet velocity, droplet size, electrostatic charge, and surfactants, as a first step in improving pesticide applications.
Agricultural Eng. Res. Lab., Wooster, OH
Donald L. Reichard, (216) 264-1021

BEAN RUST, A MAJOR FUNGUS DISEASE of snap and dry beans, was controlled biologically in tests under field conditions. Frequent application of Bacillus subtilis, a bacterium culture previously used to control bean rust under greenhouse conditions, may provide an environmentally desirable alternative to costly fungicides. Future research will seek to identify and purify the B. subtilis inhibitor and possibly modify its chemical structure to improve its stability in the environment.
Plant Pathology Lab., Beltsville, MD
C. Jacyn Baker, (301) 344-3486

AN INSECTICIDE developed from an extract of the tropical neem tree controls leafminer flies, a major insect pest of flower and vegetable crops. Produced by a commercial firm, the insecticide is the first pest control product to result from extensive ARS research demonstrating that neem tree compounds can be developed to control dozens of agricultural pests. The insecticide awaits EPA registration.
Biologically Active Natural Products Lab., Beltsville, MD
Martin Jacobson, (301) 344-2025

IN A NEW AUTOMATED PLANT CULTURE SYSTEM, plants develop twice as fast as with a manual system. Within the system, a microcomputer controls medium input and extraction in a sterile environment. Cultures were found to survive for record-breaking intervals without detriment using the automated system. The new system has promise for commercial application.
Fruit and Vegetable Chemistry Lab., Pasadena, CA 91106
Brent Tisserat, (818) 796-0239

TRICKLE IRRIGATION IS MUCH MORE EFFICIENT on cotton than is furrow irrigation when the objective is maximum lint yields and when water supplies are limited, according to the latest experiments with the traveling trickle irrigation system. The laser-directed machine also has helped demonstrate that low-cost saline water can be used to irrigate some crops because the water applied does not touch the plants.
Water Management Res. Lab., Fresno, CA
Claude Phene, (209) 291-3611

CROP PRODUCTION AND PROTECTION RESEARCH (continued)

'MARSHALL', A HARD RED SPRING WHEAT variety released in 1982 by ARS and the Minnesota Agricultural Experiment Station, has taken over 57 percent of that State's hard red spring wheat acreage. 'Era,' the former leader, dropped from 64 percent of the acreage in 1979 to 16 percent in 1984. Both varieties are semi-dwarf types. 'Marshall' has more protein than 'Era,' matures 2 days earlier, and stands up well against the elements.
Plant Science Res. Lab., St. Paul, MN
Robert H. Busch, (612) 373-1370

MEDFLY THREAT TO U.S. ORCHARDS MAY BE LESSENED when a way is found to synthesize a natural plant chemical. Scientists are about a year away from reproducing an ingredient in the oil of angelica plants, a powerful attractant to Mediterranean fruit flies. The lure lasted four times longer in field tests than the attractant currently used in traps to detect new invasions of the dangerous pest.
Biological Active Natural Products Lab., Beltsville, MD
Martin Jacobson, (301) 344-2025

USDA-DEVELOPED PECAN CULTIVARS TOOK TOP HONORS recently at an international large pecan show. Released several years ago, 'Wichita,' 'Sioux,' 'Choctaw,' and 'Cheyenne' are growing yearly in popularity. 'Wichita' is the most widely propagated cultivar here and abroad. 'Cheyenne' is most recommended for planting throughout the United States because of its good shelling qualities. Each year's pecan crop is worth about $162 million, the third largest nut crop.
Pecan Genetics and Improvement Research, Brownwood, TX
Richard Hunter, (915) 646-0593

STIMULATING APPLE TREE GROWTH INCREASES BRANCHING. Spraying 8-year-old trees with AVG (aminoethoxyvinlyglycine) right after harvest increased threefold the number of branches. This growth helps to build more quickly a fruit tree's framework. AVG has no apparent adverse side effects but is still in the experimental stage.
Tree Fruit Research, Wenatchee, WA
Eric A. Curry, (509) 662-4317

APPLYING PLANT GROWTH REGULATORS to soil beneath fruit trees could reduce excessive vegetation and improve fruit quality. Commercial application of this technique to several fruits, including apples, pears, sweet cherries, peaches, nectarines, and plums, should hasten fruit production and make it more consistent. Soil-applied growth regulators penetrate trees better and improve insect and disease control, require fewer applications, and reduce labor costs from hand pruning.
Tree Fruit Research, Wenatchee, WA
Max W. Williams, (509) 662-4317

CROP PRODUCTION AND PROTECTION RESEARCH (continued)

A NEWLY DISCOVERED MOVABLE ELEMENT IN SOYBEAN GENES may speed up genetic engineering of crop plants. Scientists have found that molecules called Tgm1 in soybean genes resemble those of "jumping" genes found earlier in corn and snapdragons. This similarity suggests that this and other movable elements may be appropriate for transferring genetic traits, like disease resistance and high nutritional value, to plants that cannot be bred by traditional means.
Plant Molecular Genetics Lab., Beltsville, MD
Lila Vodkin, (301) 344-3308

FUTURE "SOIL WARS" WILL ENLIST THE HELP OF BENEFICIAL ORGANISMS to battle soilborne fungi and bacteria that each year cause over $4 billion in U.S crop losses from disease. Over the past 3 years, research has accelerated in finding ways to pack fungus-fighting organisms in gel pellets or powders for farmers to spray onto their fields or drop into seed furrows. Several U.S patents are pending or have been granted with industries' cooperation. Agency scientists predict that the first commercial "battlefield" will be against highly-destructive seedling diseases of horticultural crops.
Soilborne Diseases Lab., Beltsville, MD
George Papavizas, (301) 344-3682

THE FIRST PLANT WITH NATURAL RESISTANCE TO SEVERAL VIRUSES has been found by agency scientists searching for plants immune to only one virus. If they can find a way to transfer this virus-resistance to cultivated species of potatoes and tomatoes, commercial producers of these crops could save more than $200 per acre a year. Growing hybrids with built-in resistance to potato leafroll, tomato yellow top, and beet curly top would be more effective and less expensive and would not harm the environment.
Vegetable Crops Production, Prosser, WA
Peter E. Thomas, (509) 786-3454

FUNGUS IS IMPLICATED FOR FIRST TIME IN WHEAT AND BARLEY disease in the Pacific Northwest. Discovery of Rhizoctonia bare patch in no-till and reduced tillage fields--the first reported case of this fungus-caused disease in the United States--is important because of the increasing trend toward conservation tillage.
Wheat Breeding and Production, Pullman, WA
David Weller, (509) 335-6210

POTATO GROWERS CAN SAVE $60 per acre in fertilizer cost by better balancing irrigation water and nitrogen applied to optimize potato yields on sandy soils. Several years of research in Washington showed that farmers have been applying too much water, and thereby moving fertilizer out of the reach of plants--so they had to apply more fertilizer than was actually needed by the potatoes.
Soil and Water Management, Prosser, WA
David A. Lauer, (509) 786-3454

CROP PRODUCTION AND PROTECTION RESEARCH (continued)

SHADE AND FLOWERING TREES WITH TOUGHER WOOD can be bred now that scientists have found ways to select, within 1 year, young trees that resist decay caused by injury. Research confirms that trees inherit the ability to manufacture chemicals that "box in" wounded wood, thus preventing further decay. Decay seldom kills trees, but decayed trees occasionally fall on people and cause much property damage each year.
U.S. National Arboretum, Washington, DC
Frank Santamour, (202) 475-4850

THOUSANDS OF CEREAL GRAINS BEING GROWN in field nurseries will undergo a battery of tests aimed at cataloging their characteristics for inclusion in the National Small Grain Collection. For positive identification and botanic classification, such qualities as early maturity, short stalk, and high yielding are being determined as well as resistance to diseases, insects, and drought, extreme temperatures, and end-product use (like milling, baking, malting, and cooking). All these findings will significantly enhance the collection's value to plant breeders and other researchers worldwide who depend on the collection for seed and germplasm to develop new and better varieties of grains.
Germplasm Resources Lab., Beltsville, MD
Leland W. Briggle, (301) 344-3713

ANIMAL PRODUCTION AND PROTECTION RESEARCH

FEED COST FOR FINISHING BEEF CATTLE CAN BE REDUCED by 25 cents per pound if the animals have grazed wheat forage before the finishing period. Tests showed that cattle grazing wheat forage, a feed source high in nonprotein nitrogen, gained more weight faster than they did on other feeds during the early part of the 200-day fattening period before they were slaughtered.
Livestock and Forage Res. Lab., El Reno, OK
William Phillips, (405) 262-5291

TESTS WERE "ENCOURAGING" of a genetically-engineered antigen that could become a key to developing a vaccine against coccidiosis, an intestinal disease of poultry that costs the industry $300 million a year. ARS researchers worked with Genex Corp. to develop the antigen, which conferred the first protection ever obtained against any species of coccidia by any method other than inducing actual infection. Work with Genex will continue to turn the antigen into a vaccine.
Animal Parasitology Institute, Beltsville, MD
Harry Danforth, (301) 344-2427

USING A SIMPLE NEW PROGRAM, a small, inexpensive computer can regulate the environment of a poultry house, maintaining temperature and humidity within a narrow range. Until now, a skilled operator was required to make adjustments to control the environment in broiler houses, especially during periods of changing weather.
Poultry Mechanization Res. Lab., Miss. State, MS
Floyd N. Reece, (601) 323-1964

ANIMAL PRODUCTION AND PROTECTION (continued)

CALF DEATHS, which cost U.S. beef producers more than $300 million annually, could be cut in half through improved management, according to ARS animal researchers. Records show that nearly 70 percent of calf losses occur at calving or during the first 72 hours after birth, with the major causes of death delayed or difficult births. This not only reduces the calf crop but also reduces the pregnancy rate the following year. One week after birth, the leading cause of calf death was disease, including pneumonia and scours.
Fort Keogh Livestock and Range Res. Sta., Miles City, MT
Robert A. Bellows, (406) 282-4970

PLASTIC BEEHIVE COVERS costing about $5 each helped honeybee colonies survive Wisconsin winters on 20% less honey than colonies consumed in uncovered hives. The ARS-designed covers, which should last from 5-10 years, are made from translucent white plastic.
Bee Mgt. and Entomology Res. Lab., Madison, WI
Eric H. Erickson, Jr., (608) 262-1732

NOT DIET ALONE, but an interaction between genetic makeup and diet, has been found to affect the cardiovascular system of pigs--eventually. A diet loaded with fat and cholesterol had no deleterious effects on either genetically fat or genetically lean pigs that were slaughtered at 6 months. After 16 months, however, lean pigs had more aorta surface with fat accumulations than did genetically obese pigs. Besides having implications on how diet and genetic makeup interact to increase pork production, the study may have implications for humans, since pigs are being used more and more as models in an attempt to resolve dietary and cardiovascular problems in man.
U.S. Meat Animal Research Center, Clay Center, NE
Wilson Pond, (402) 762-3241

TWO PRESSURIZED SPRAYS available commercially proved effective in protecting people from a tiny tick, Ixodes dammini, that transmits Lyme disease. First diagnosed 10 years ago in Old Lyme, Conn., the disease leaves many human victims with sore, swollen joints and, in some cases, heart disorders. In ARS tests in a tick-infested area in Massachusetts, a 0.5% permethrin spray applied to the exterior surface of military pants and jacket provided complete protection against attack by all life stages of the tick. Applications of 20% and 30% deet, a common insect repellent, provided 86% and 92% protection, respectively. Lyme disease is now the most common tick-borne disease in the United States.
Insects Affecting Man and Animals Res. Lab., Gainesville, FL
Carl E. Schreck, (904) 374-5968

ANIMAL PRODUCTION AND PROTECTION RESEARCH (continued)

MODIFYING ANIMAL DIETS by adding high levels of high-fiber foodstuffs in order to reduce costs was found to have some adverse effects upon sows during gestation. Reproductive performance was not affected by the addition of up to 95 percent alfalfa meal, except that the weaning weights in pigs was reduced. There was a significant reduction, however, in the sow's ability to digest fiber components at 100 days of gestation. That would suggest problems with under-nutrition, particularly with respect to energy, could occur during late gestation in sows fed high levels of high-fiber diets.
Nonruminant Animal Nutrition Lab., Beltsville, MD
Corlette Calvert, (301) 344-2222

A ROUGHENED PLASTIC LOOP helps cows fight off mastitis, the most serious disease of dairy cows, causing estimated losses of over $1 billion yearly. Cows with the new loop, inserted harmlessly into udders, experienced a 75% reduction in severe mastitis. The roughened surfaces of the loops attract disease-fighting white blood cells in the udder and are far more effective than loops with smooth surfaces that were tested several years ago.
Milk Secretion and Mastitis Lab., Beltsville, MD
Max J. Paape, (301) 344-2303

SHEEP UDDER DISEASE WAS ISOLATED FOR THE FIRST TIME in about 5 to 10 percent of range ewes in some Oregon and Idaho flocks. Microscopic lesions, characteristic of the virus-caused "firm udder disease," lower ewes' milk production so they must be culled, since they cannot produce enough milk for lambs. Ewes inoculated with the virus, however, failed to exhibit the classical symptoms of the disease. Research is continuing, but findings so far are a crucial first step in eventually controlling the disease.
Animal Disease Research, Pullman, WA
Scott Adams, (509) 335-6022

A VACCINE CONTAINING KILLED BLUETONGUE VIRUS that has been irradiated protects sheep from the disease when given in two sequential doses. Further research is under way to determine the optimal dose of radiation needed to inactivate the virus and stabilize the vaccine for storage as well as the optimal dose needed to immunize sheep. The new vaccines are safer to livestock than those that use live virus. They protect sheep against two of the five strains of the disease. Bluetongue costs farmers more than $30 million annually in losses.
Animal Disease Research Center, Plum Island, NY
Charles H. Campbell, (516) 323-2500

SYSTEMIC INSECTICIDE REDUCES EFFECTS OF BLUETONGUE disease of sheep. A single treatment with famphur, an experimental insecticide, can be applied while routinely handling animals before bluetongue season in fall. Famphur cannot prevent infection of bluetongue virus, but treated sheep show no symptoms of the disease--mouth sores, lameness, and abortions. The virus is spread by biting gnats.
Arthropod-borne Animal Disease Research, Denver, CO
Frederick R. Holbrook, (303) 234-2474

ARS Quarterly Report - p. 10

A POISON PLANT MAY CAUSE LAMB LOSSES OF 50 PERCENT in the Pacific Northwest when grazed by pregnant ewes. The toxic weed, called false hellebore, has been known to cause deformities in lambs. Now agency scientists suspect the plant may cause ewes to abort or lambs to die right after birth, depending on when during their pregnancy ewes eat the plant. Sheep deaths from eating poisonous plants cost ranchers over $10 million annually.
Poisonous Plant Res. Lab., Logan, UT
Richard F. Keeler, (801) 752-2941

CATTLE POISONED BY EATING TOXIC PLANTS for a short period may get sick and die many months later. Cattle fed three plants containing a chemical called pyrrolizidine alkaloids showed no immediate signs of poisoning; however, many months later they developed the classical symptoms and soon died. The discovery helps to explain why cattle sometimes are unproductive or die from undiagnosed causes.
Poisonous Plant Res. Lab., Logan, UT
A. Earl Johnson, (801) 752-2941

CROP UTILIZATION & POST-HARVEST TECHNOLOGY RESEARCH

ENZYMES IN CEREAL GRAINS are inactivated by heating so that they can be milled into flavor-stable, high-fat flours with texture and functional properties equal to those of fresh or degerminated flours. The process, for which a patent is being sought, inactivates peroxidase and lipase enzymes in corn, wheat, oats, rice, sorghum, millet, barley and rye. It retains natural oxidants and the germ, which is rich in nutrients.
Field Crops Post-Harvest Research, Peoria, IL
George N. Bookwalter, (309) 685-4011, Ext. 419

A QUICK AND EASY WAY TO MEASURE SALT IN HAMS and other processed meats has been developed by agency scientists. The new instrument has been developed to measure sodium chloride content by reflecting near-infrared light off these meats. Food processors and meat inspectors may use the new method to help keep down salt levels.
Instrumentation Lab., Beltsville, MD
Karl H. Norris, (301) 344-3650

A NEW PROCESS prevents free fatty acid formation on rice bran during storage. This opens up a new source of edible oils in rice-growing countries where domestic edible oil is in short supply. Without this process, the high level of free fatty acid formation in unstabilized rice bran makes extraction of edible oil too costly. India has signed a contract with the United States for use of the process.
Western Regional Research Center, Albany, CA
Robert Sayre, (415) 486-3821

CROP UTILIZATION & POST-HARVEST TECHNOLOGY RESEARCH (continued)

CRACKED EGGS that now escape detection in packing plants can be discovered quickly by running them through a staining machine designed by an ARS engineer. The machine sprays eggs with a stain, then washes them off. Hairline cracks show up in blue. Cracked eggs can still be used in shelled-egg industries.
Russell Agricultural Research Center, Athens, GA
James A. Dickens, (404) 546-3531

FERMENTATION OF CORN dry-milled fractions to ethanol yields distillers' grains that are potentially superior to corn distillers' grains. The by-products from the fermentation of corn grits and flours contain more protein but less fat and fiber than contained in corn distillers' grains. Lower fiber content may be desirable in baby foods. Lower fat content may offer better taste and more stability in storage.
Northern Regional Research Center, Peoria, IL
Y. Victor Wu, (309) 685-4011, Ext. 328

DRY-MATTER AND SWEETNESS OF ONIONS are measured with a new instrument that uses spectrophotometry, a process that exploits the interaction of chemicals and light. The instrument can separate onions high in dry-matter from those low in dry-matter, permitting the low-dry-matter onions, which spoil more quickly, to be marketed first. The "onion meter" can also screen onions for desired qualities for breeding purposes.
Quality Evaluation Res. Lab., Athens, GA
Gerald Dull, (404) 546-3320

BITTERNESS IN GRAPEFRUIT JUICE and the juice of navel oranges can be greatly reduced and the flavor improved by a process that relies on polymers made from simple sugars. The sugars are used as packing in a column through which whole juice is passed.
Citrus and Subtropical Products Lab., Winter Haven, FL
Robert Berry and Philip Shaw, (813) 293-4133

A NEW SUNFLOWER SYNTHETIC (a diverse collection of seeds selected for one common characteristic) that is high in oleic acid has been released cooperatively by ARS and North Dakota State University to breeders and industry. High oleic sunflower hybrids may be derived from this material in the future. Sunflower oil high in oleic acid can be heated to a higher temperature without smoking, frying food, like potato chips, faster. The oil also can be used longer.
Oilseeds Res. Lab., Fargo, ND
Jerry F. Miller, (701) 237-7728

A PRIVATE FIRM, the Mycogen Corporation of San Diego, CA, has applied for an exclusive license to develop, manufacture, and market the ARS-invented Mycoherbicide Pelletizing Process. The system can be used in applying microbial-based pesticides.
Southern Weed Science Lab., Stoneville, MS
Wm. Connick, Lynn Walker, Paul Quimby, Jr., (601) 686-2311

CROP UTILIZATION & POST-HARVEST TECHNOLOGY RESEARCH (continued)

SOFTNESS WITH INNER STRENGTH is the idea behind a new way of blending fabrics developed by ARS scientists. The material, called "filament-core," combines the best qualities of cotton and polyester in a new way. Instead of combining short, chopped strands of cotton and polyester, cotton fibers are wrapped completely around a continuous filament of polyester. The fabric has the feel of 100% cotton with the strength and durability of polyester. Several commercial companies have expressed interest in the process.
Special Products Lab., New Orleans, LA
Robert Harper, (504) 589-7561

HUMAN NUTRITION RESEARCH

FOLIC ACID CONTENT OF FOODS can be assayed in half the time it used to take--and with less chance of human error--with an automated, computerized technique recently developed by ARS. Folic acid, a B-complex vitamin, is used in the treatment of nutritional anemias and of sprue, a chronic deficiency disease.
Western Regional Research Center, Albany, CA
Pamela M. Keagy, (415) 486-3193

LARGE DOSES OF FOLIC ACID CAN BE HARMFUL to pregnant women and to persons on zinc-deficient diets. A nutrition study showed that too much folic acid, an ingredient in vitamins, increased the incidence of maternal infection, fetal distress, and other complications. Males need only about 200 micrograms of folic acid a day, rather than the 400 micrograms currently listed as the recommended daily allowance. Either amount can be safely consumed by eating foods, like liver, beans, nuts and green leafy vegetables that are rich in natural folic acid.
Grand Forks Human Nutrition Research Center, Grand Forks, ND
David B. Milne, (701) 775-8353

NEW PORTABLE METHOD TO MEASURE TOTAL BODY FAT is faster and more accurate than measuring skinfold--the most commonly used method. Called infrared interactance, the method uses near-infrared light to estimate the percentage of body fat in humans. Scientists are testing this easy and harmless method for use by physicians, dietitians, athletes, and agencies involved in Third World development.
Energy and Protein Nutrition Lab., Beltsville, MD
Joan M. Conway, (301) 344-2977

A ONE-YEAR STUDY OF PEOPLE'S EATING HABITS, the first of its kind, raises new questions about how nutritional values have been traditionally measured. For example, when trained subjects were asked to record their food intakes, they repeatedly reduced the amount they normally ate by about 18 percent. The 12-month study monitored the intake of calories and 19 nutrients by 28 men and women in the Washington area. Typically, nutritional studies last only a few weeks.
Human Nutrition Research Center, Beltsville, MD
Dr. Walter Mertz, (301) 344-2157

HUMAN NUTRITION RESEARCH (continued)

YOGURT MAY HELP ALLEVIATE GASTROINTESTINAL INFECTIONS when the fermented milk is eaten by people whose vitamin and mineral levels are normal. Scientists are looking into this milk product's remarkable effects. Expanding the market for yogurt will help use surplus milk as well as provide a major source of calories and protein for the world's poor and undernourished, who are most susceptible to intestinal infections.
Protein Nutrition Lab., Beltsville, MD
Anthony D. Hitchins, (301) 344-2331

EXPERT SYSTEMS RESEARCH

A NEW COMPUTER PROGRAM will help provide increased protection for soil in the grain-farming region of the Pacific Northwest. Using air temperature records of prior years, the model estimates for farmers the latest possible fall seeding date that will provide enough crop cover to keep down soil losses from erosion.
Columbia Plateau Conservation Res. Center, Pendleton, OR
Ronald W. Rickman, (503) 276-2811

GLYCIM, A COMPUTER MODEL, simulates soybean growth under a variety of conditions. It summarizes what is known about the physical and physiological processes involved in the movement of water, carbon, nitrogen, oxygen, and other materials in the plant, soil, and atmosphere. It also predicts the number and size of organs on the plants, their response to their environment, and final yield.
Crop Science Research Lab., Mississippi State, MS
Basil Acock, (601) 325-2311

QUARTERLY REPORT ON SELECTED RESEARCH PROJECTS
OF THE AGRICULTURAL RESEARCH SERVICE
U.S. Department of Agriculture
October 1 to December 31, 1984

INSECT AND WEED CONTROL RESEARCH

A FUNGUS THAT DESTROYS GYPSY MOTHS IN JAPAN will be lab- and field-tested by ARS scientists at Ithaca, N.Y. The fungus could serve as another biological weapon against the insect pest's American cousins.
Insect Pathology Research Unit, Ithaca, N.Y.
R. S. Soper, Jr., insect pathologist, (607) 257-2030.

TO HOLD THE LINE ON THE SPREAD OF A PARASITIC MITE of bees that threatens the $180 million U.S. honey bee industry, an ARS entomologist from Laramie, Wyo., has been temporarily assigned to Weslaco, Tex., to cooperate with Mexican and Canadian scientists on controlling the pest.
Fruit Protection and Production Research, Weslaco, Tex.
W. Wilson, entomologist, (512) 986-3159.

AVERMECTIN, A NATURAL PRODUCT derived from soil microorganisms, has proved effective in lab and field studies against the red imported fire ant. It also shows promise in controlling boll weevils, bollworm, and tobacco budworm. The chemical will soon be commercially available.
Insects Affecting Man and Animals Laboratory, Gainesville, Fla.
D. F. Williams, entomologist, (904) 373-6701.

BETTER CONTROL OF LEAFY SPURGE IS NOW POSSIBLE by combining herbicides, plant growth regulators, and new application techniques that increase herbicidal effectiveness. The new system reduces the amount of chemicals needed for control, cuts costs per acre, and lowers environmental risks. Leafy spurge is a noxious, perennial weed that has damaged 3 million acres of U.S. pasture and rangeland, causing annual losses of about $20 million.
North Dakota, Montana, and Wyoming Experiment Stations
W. Shaw, national program leader, weed science, (301) 344-3301.

STINGLESS WASPS FROM EUROPE SAVED FARMERS $29 MILLION throughout the East and Midwest over the past nine years by protecting alfalfa fields from a costly pest called the alfalfa blotch leafminer, also an immigrant from Europe. Since first released, the wasps have overtaken and killed fast-spreading leafminer populations from the Canadian Maritime Provinces to Virginia and west to Michigan. Last year, the buildup of wasps was sufficient to prevent damage estimated at $13 million to alfalfa crops in 10 of the states. Alfalfa is nutritionally the leading feed crop of livestock and is grown on more than 26 million acres nationwide.
Beneficial Insects Research Laboratory, Newark, Del.
R. M. Hendrickson, entomologist, (302) 731-7330.

EVIDENCE THAT DWARF BUNT DISEASE of wheat could not cause an epidemic in Chinese winter wheat is presented in an ARS research report. The evidence should help U.S. wheat growers convince China that it should lift a quarantine on wheat grown in the Pacific Northwest.
Forage Seed and Cereal Research, Corvallis, Oreg.
E. J. Trione, chemist, (503) 754-3451.

INSECT AND WEED CONTROL RESEARCH (continued)

MINERAL AND VEGETABLE OILS PLUS SEX PHEROMONES can effectively trap and suffocate grain weevils as well as flour, warehouse, and sawtoothed grain beetles. The new traps will enable food-processing plants and warehouses to quickly monitor the migration and buildup of beetles and to use less pesticide and to help remedy environmental safety problems of bakeries and warehouses in controlling pests.
Bee Management and Entomology Research, Madison, Wis.
W. E. Burkholder, entomologist, (608) 262-1732.

THE EUROPEAN ASPARAGUS WEEVIL can now be curbed with a two-pronged attack. First, the huge stands of wild asparagus the weevils feed on should be eliminated. Then fall tillage combined with pesticide spraying should kill at least 90 percent of overwintering insects.
Insect Ecology and Behavior Research, Yakima, Wash.
E. Halfhill, entomologist, (509) 575-5974.

LYGUS BUGS THAT COST $54 MILLION A YEAR IN CROP LOSSES and control measures in California alone can now be studied without seasonal interruption. A new mass-rearing procedure and artificial diet allows these pests to be studied year-round without relying on their natural food, fields of green bean pods.
Biological Control of Insects Research, Tucson, Ariz.
H. Graham, entomologist, (602) 629-6220.

TWO TOXINS FROM CROP RESIDUES ARE CUTTING YIELDS OF WHEAT AND BARLEY grown under no-till. Acetic and butyric acids, formed in decaying straw and chaff left from the previous crop, are the culprits. Studies are now underway to see if moving the straw and chaff and seeding crops in one operation would control toxins and at the same time save fuel costs.
Land Management and Water Conservation, Pullman, Wash.
L. Elliott, microbiologist, (509) 335-1551.

AFRICANIZED BEES CONTINUE THEIR NORTHWARD MARCH and are now in Central America. Besides threatening American agriculture by reducing native bee pollination and honey production, the bees would cause a $54 million loss to the beekeeping industry if they spread to Savannah, Ga. as projected. Moreover, recent research indicates the bees can overwinter as far north as New York City, which could double or triple estimated losses. ARS scientists are currently investigating various ways to deal with the problem, like breeding more gentle and productive Africanized bees and learning how to better manage domestic honey bees.
Bee Breeding and Stock Center Laboratory, Baton Rouge, La.
T. Rinderer, geneticist, (504) 766-6064.

A NEW SEX LURE ISOLATED FROM MALE RICE WEEVILS attracts grain weevils. Called an "aggregation pheromone," it lures both sexes of rice, maize, and granary weevils to traps for monitoring and control. Previously, few effective attractants had been found for grain weevils
Bee Management and Entomology Research, Madison, Wis.
W. E. Burkholder, entomologist, (608) 262-3795.

INSECT AND WEED CONTROL RESEARCH (continued)

COLOR AERIAL PHOTOGRAPHY IS BEING USED TO DETECT infestations of camphorweed, a troublesome weed increasing its hold on south Texas rangelands. The weed produces a profusion of bright yellow flowers in the fall, when photographs can help researchers pinpoint infested areas, monitor the weed's spread, and delineate areas needing control measures.
Remote Sensing Research, Weslaco, Tex.
J. H. Everitt, range scientist, (512) 968-5533.

GAS CHROMOTOGRAPHY HAS RESOLVED A CONTROVERSY over the number of species of imported fire ants by comparing the venom from both red and black ants. Analysis of alkaloid patterns in ants' venom as well as the fact that the ants can intermate prove there is only one species--a finding that will help facilitate their control.
Insects Affecting Man and Animals Research Laboratory, Gainesville, Fla.
C. Lofgren, entomologist, (904) 737-6701.

PREEMERGENCE SPRAYING IS THE KEY TO HOLDING DOWN JIMSONWEED IN SOYBEANS. A four-year study showed that, when the weed was allowed to grow with soybeans, yields were reduced 23 percent as compared with only a 3 percent decrease when weeds emerged four weeks later than soybeans. Keeping soybeans free of several other weeds will also increase yields.
Soybean Protection Research, Urbana, Ill.
E. Stoller, plant physiologist, (217) 333-1277.

RED FLOUR BEETLES MAY SOON SUCCUMB TO MALATHION, thanks to isolation of the specific gene that provides resistance to this most commonly used insecticide for stored grain. By modifying the specific genes in the insect that resist insecticides, scientists may be able to develop an improved strategy with insecticide control. The red flour beetle's resistance has intensified in the last 15 years throughout the Midwest and Southeast, especially in Alabama, Florida, and Georgia.
U.S. Grain Marketing Research Laboratory, Manhattan, Kans.
R. Beeman, entomologist, (913) 539-9141.

TEN PERCENT HIGHER RICE YIELDS AND LOWER WEED CONTROL COSTS have boosted net profits of rice growers in the South by $25 million a year. New integrated weed management systems--that include fewer fertilizer and disease control applications and better water management--have increased yields and eliminated the need for two herbicide applications on 500,000 acres of rice.
ARS Research Production and Weed Control Research, Stuttgart, Ark.,
W. Shaw, national program leader, weed science, (301) 344-3301/Roy Smith, agronomist, (501) 673-2661.

NATURAL ALLELOCHEMICALS ARE AN EXCITING NEW WAY TO CONTROL WEEDS. Some weeds manufacture and exude chemicals through their roots and stems that injure other species growing nearby. One such plant, spikerush, exudes several chemicals harmful to aquatic weeds. These allelopathic chemicals have been identified, and progress is being made in synthesizing them. Allelochemistry offers many new approaches to selective weed control.
Western Regional Research Center, Oakland/Davis, Calif.
W. Shaw, national program leader, weed science, (301) 344-3301.

INSECT AND WEED CONTROL RESEARCH (continued)

FENOXYCARB APPLIED TO STORED WHEAT successfully controlled the rice weevil, lesser grain borer, confused flour beetle, and Indianmeal moth for two months without lowering the grain's germination. It appears to be an excellent pesticide candidate for protecting stored grain.
U.S. Grain Marketing Research Laboratory, Manhattan, Kans.
R. Beeman, entomologist, (913) 776-2710.

FENITROTHION, AN INSECTICIDE, shows promise for protecting stored peanuts. For years, malathion and synthesized pyrethrins have been the only two insecticides approved for use on stored oilseeds, but insect resistance to malathion and the uncertain supply of pyrethrins has spurred the search for substitutes. Like malathion, fenitrothion degraded after one year yet was more effective than malathion at all standard treatment rates.
Stored-Product Insects Research and Development Laboratory, Savannah, Ga.
L. Redlinger, entomologist, (912) 233-7981.

FOLIC ACID AND RIBOFLAVIN, both B-vitamins, may help protect a virus from breaking down during biological warfare against gypsy moths. Normally, the virus breaks down under the ultraviolet rays of the sun; the B-vitamins act as sunscreens for the virus in the same way that they protect human beings from sunburn.
Gypsy Moth Rearing Research, Otis Air National Guard Base, Mass.
M. Shapiro, entomologist, (617) 563-9303.

HONORS FOR 1984 ARS SCIENTIST OF THE YEAR went to James H. Tumlinson III for heading a team of USDA researchers that identified and synthesized the pheromones of several major insect pests. These chemicals are now being used commercially to lure insects into traps or to confuse them so they fail to mate.
Insect Attractants, Behavior, and Basic Biology Research Laboratory, Gainesville, Fla.
J. H. Tumlinson, chemist, (904) 373-6701.

CROP RESEARCH

SINGLE CELLS FROM POTATO PLANTS that are difficult to cross are being fused to overcome major barriers to breeding better potatoes. The research is aimed at fusing cells from South American species with cultivated U.S. lines to capture genes that transmit such traits as disease resistance into domestic potatoes. New potato plants bred by cell fusion are generally bigger and stronger than either parent and are resistant to potato leaf roll virus, qualities needed by the $1.7 billion U.S. potato industry.
Plant Disease Resistance Research, Madison, Wis.
J. P. Helgeson, plant physiologist, (603) 262-1541.

RESISTANCE TO COLD, DROUGHT, NEMATODES, AND DISEASE is being bred into orange trees using Australian and Chinese relatives of citrus. Also promising is an Australian citrus relative whose fruit takes only one-third as long to mature as oranges.
U.S. Horticultural Research Laboratory, Orlando, Fla.
H. Barrett, geneticist, (305) 898-6791.

CROP RESEARCH (continued)

FRUIT TREES CAN BE AUTOMATICALLY PRUNED--a year ahead--by applying a chemical called paclobutrazol to soil at the base of apple and other orchard trees. Branches automatically grow "pruned" the next year, letting in more fruit-producing light and eliminating insect hiding places. The technology could revolutionize how fruit is grown in the future.
Production, Harvesting, and Handling of Tree Fruits Research, Wenatchee, Wash.
M. Williams, plant physiologist, (509) 662-4317.

TO IMPROVE HONEY BEE HEALTH, drones are being bred to do a better job of removing dead and dying bees from the hive, lessening the chance of a disease like chalkbrood spreading through bee colonies. Chalkbrood is a fungus disease that can kill up to 50 percent of bee colonies. Bees annually produce honey and beeswax worth $140 million.
Carl Hayden Bee Research Center, Tucson, Ariz.
M. A. Gilliam, microbiologist, Honey Bee Nutrition Research, (602) 629-6347.

SPEEDY IDENTIFICATION OF THE NEW CANKER DISEASE OF CITRUS was possible because of research already underway at Beltsville on new methods for rapid and accurate disease diagnosis. The sophisticated test identified the disease not only as canker but also as a new strain of the bacterium, information that was so thorough and conclusive that eradication steps were initiated in Florida without delay. The same test also identified a bacterium that caused a new but similar disease found in Mexico. Its quick identification allowed USDA's Animal and Plant Health Inspection Service to make appropriate regulatory decisions to prevent entry into the United States.
Fruit Laboratory, Beltsville, Md.
E. Civerolo, plant pathologist, (301) 344-3569.

NEW PLANTING TECHNIQUE TRIGGERS FAST PEACH GROWTH. Planting young peach trees in killed sod can increase their growth by up to 45 percent in new orchards so that a sizable crop may be harvested in three years. Other kinds of fruit trees may also grow faster planted in killed grass.
Appalachian Fruit Research Station, Kearneysville, W. Va.
W. Welker, soil scientist, (304) 725-3451.

'GUARD,' THE ONLY HARD RED SPRING WHEAT with resistance to Hessian fly, was grown on 20,000 acres in South Dakota in 1984. Next year's planting is expected to reach 250,000 acres. 'Guard,' bred by ARS and South Dakota State University scientists and released in 1983, is also a high producer.
Plant Science and Entomology Research, Manhattan, Kans.
J. Hatchett, entomologist, (915) 532-5861.

TO STEER HONEY BEES AWAY FROM PESTICIDE-TREATED CROPS, scientists are looking at selective breeding among other methods, to develop bees that zero in on targeted pollens. Honey bees will not naturally respond to dietary conditioning, a tactic that works on other insects. Bees move pollen to fertilize crops worth nearly $19 billion annually.
Honey Bee Pesticides/Diseases Research, Laramie, Wyo.
A. Stoner, entomologist, (307) 766-2281.

CROP RESEARCH (continued)

ARTIFICIAL WINDSTORMS REVEAL PLANT CELLS ARE LOST IN WINDSTORMS. A wind tunnel in Manhattan, Kans., is providing new evidence that cells of young plants—as well as the soil—are literally blown away in windstorms that sweep across Great Plains farmlands. Farming practices that slow wind speed to 15 miles an hour at ground level will protect both soil and such crops as sorghums, soybeans, and wheat.
Wind Erosion Research, Manhattan, Kans.
D. V. Armbrust, soil scientist, (913) 776-2716.

INCREASING THE CALCIUM CONTENT OF PEARS AND APPLES can cure fruit of disorders that occur during growth and storage, like green stain, alfalfa greening, freckle pit, and cork spot. It also increases by 10 percent the calcium available for human nutrition from eating fruit.
Production, Harvesting, and Handling of Tree Fruits Research, Wenatchee, Wash.
J. T. Raese, plant physiologist, (509) 662-4317.

TAN SPOT, A DISEASE THAT CUTS YIELDS OF SUSCEPTIBLE SOYBEAN varieties by as much as 18 percent in about 84 percent of fields in southwestern Iowa, left unscathed such new varieties as 'Amsoy 17,' 'Beeson,' and 'Harcor'—all bred by ARS scientists to resist the disease.
Cereal and Soybean Improvement Research, Ames, Iowa.
J. Dunleavy, plant pathologist, (515) 294-3122.

ZINC DEFICIENCIES CAN STUNT BEAN, POTATO, AND SWEET CORN GROWTH, but the problem can be solved by crop rotation. Beans not fertilized with zinc grew normally when planted after corn but absorbed 12 times as much zinc as when grown after sugarbeets or fallow. Why beans take up more zinc following corn is now under study.
Snake River Conservation Research Center, Kimberly, Idaho.
G. Leggett, soil scientist, (208) 423-5582.

FERTILIZING RANGELANDS with about 200 pounds per acre of ammonium nitrate consistently increased soil water use, tripled or quadrupled grass yields, and boosted protein content of grasses by 9 percent or more in a 9-year study.
Soil and Water Conservation Research, Lincoln, Nebr./Forage, Range, and Shelterbelt Research, Mandan, N. Dak.
J. Power, soil scientist, (402) 472-1484.

ETHREL, A PLANT GROWTH REGULATOR that prevents sugarcane from flowering, passed three years of tests and was recently approved by the U.S. Environmental Protection Agency for large-scale use on sugar plantations. Flowering decreases sugarcane yields by as much as 30 percent. Other benefits observed with ethrel have been extra growth and higher sugar yields.
Sugarcane Production Research, Aiea, Hawaii.
P. H. Moore, plant physiologist, (808) 487-0561.

PYTHIUM ROOT ROT SAPS WHEAT YIELDS in the Pacific Northwest by 15 to 20 percent, but the disease had gone unobserved because it stunts wheat plants uniformly. The identification of 10 species of Pythium is an essential first step toward its eventual control.
Wheat Breeding and Production Laboratory, Pullman, Wash.
J. R. Cook, plant pathologist, (509) 335-3722.

ARS Quarterly Report - p. 7

CROP RESEARCH (continued)

A SINGLE APPLICATION OF PHOSPHORUS in 1967 has maintained wheat yields at higher levels on phosphorus-deficient soils in Montana after 10 crops in 17 years. The single application of 80 pounds per acre, without nitrogen, increased yields each crop year by 15 percent over those on untreated land. Adding nitrogen, just 40 pounds per acre each crop year, increased yields 32 percent. Estimated net return per acre: $19 more than the cost of fertilizing. About 20 million acres in the Northern Great Plains are phosphorus-deficient.
Central Great Plains Research Center, Akron, Colo.
A. Halvorson, soil scientist, (303) 345-2259.

TWO NEW SOYBEAN VARIETIES resistant to soybean cyst nematode have been released for commercial production. Their resistance, combined with early maturity, will extend production 150 miles farther north to cyst-infested fields of the central Midwest. Soybean cyst nematode costs growers about $150 million annually. Another resistant variety, 'Epps,' has been released for the South.
Soybean Breeding and Production Research, Urbana, Ill./ Nematology Research, Jackson, Tenn.
R. L. Bernard, geneticist, (217) 333-6459/L. D. Young, plant pathologist, (901) 424-1643.

MONOCLONAL ANTIBODIES—DIAGNOSTIC TOOLS DEVELOPED IN MEDICAL RESEARCH--are helping scientists identify the best Rhizobium strains to fix nitrogen and spur forage production in poor, acidic soils. Scientists will then try to exploit superior Rhizobium-innoculated crops to increase yields in poor soils.
Appalachian Soil and Water Research, Beckley, W. Va.
S. E. Wright, microbiologist, (304) 252-6426.

SEED OF 'HYCREST,' the first interspecific hybrid of crested wheatgrass, has been released to breeders. Well adapted to intermountain rangelands, 'Hycrest' grows well under semiarid conditions, is an excellent seed producer, and is as well accepted by grazing animals as other crested wheatgrass. It is expected to make a major impact toward revitalizing rangeland in the sagebrush ecosystem.
Forage and Range Research Laboratory, Logan, Utah
K. H. Asay, geneticist, (801) 750-3066.

COMPUTERIZED ESTIMATES OF WHEAT AND CORN YIELDS have become increasingly accurate and valuable in global crop-production forecasts. In recent tests, data from 25 sites spread around the world were punched into computerized models of corn and wheat production. The computer simulations were accurate most of the time and are now being evaluated for use by USDA's Foreign Agricultural Service in parts of Asia and Europe.
Hydrology Laboratory, Beltsville, Md.
J. Ritchie, soil scientist, (301) 344-3490.

THREE ELMS OF DIFFERING SHAPES with resistance to Dutch elm disease are now available to the public from nurseries. 'Dynasty,' a strong, vase-shaped tree, is the first major cultivar of Chinese elm to be introduced into the U.S. 'Homestead' and 'Pioneer' elms, while resistant, lack the American elm's classic vase shape. However, both are highly tolerant of such urban stresses as air pollution.
National Arboretum, Washington, D.C./Nursery Crops Research, Delaware, Ohio.
F. S. Santamour/A. M. Townsend, plant geneticists, (202) 475-4864.

CROP RESEARCH (continued)

FLUID DRILLING is a new technique for planting seeds by suspending them in a protective gel that carries them into the soil. The method, which also works for very young seedlings, may prove cheaper than using transplants to provide wildlife with food and cover on ranges, forests, and mined lands.
High Plains Grasslands Research Station, Cheyenne, Wyo.
D. T. Booth, range scientist, (307) 778-2220.

SEVERAL VARIETIES OF FOREIGN AND DOMESTIC VEGETABLES have proved promising candidates for cash crops on small U.S. farms. Those that adapt well and enjoy good consumer acceptance include the edible peapod, seedless watermelon, mung bean, and greenhouse cucumber.
U.S. Vegetable Laboratory, Charleston, S.C.
E. V. Wann, plant geneticist, (803) 556-0840.

BEEF PRODUCERS CAN BEAT THE GRASS SHORTAGES that generally come in July and August. By planting seed mixtures that combine warm-season grasses, such as switchgrass and bluestem, with cool-season grasses, farmers can be assured that forage will be available during late summer.
Forage Plant-Soil-Climate Interactions Research, University Park, Pa.,
G. Jung, agronomist, (814) 237-7638.

THE REMOTE SENSING POTENTIAL OF LASER SYSTEMS for detecting crop stress has been demonstrated by ARS scientists. Corn deficient in iron, nitrogen, potassium, and phosphorus and soybeans deficient in boron, phosphorus, sulfur, calcium, magnesium, or potassium can be clearly differentiated from well-fertilized plants. Early stress detection should help improve crop production and commodity forecasting.
Field Crops Laboratory, Beltsville, Md.
J. E. McMurtrey III, agronomist, (301) 344-2646.

ANIMAL RESEARCH

ADDING A SMALL AMOUNT OF YEAST TO CALVES' FEED can help them regain appetites lost to stress from weaning or transportation. Not eating adequately makes calves susceptible to viral and bacterial infections. Just 1 to 2 percent yeast added to calves' poststress diet increased their appetites and ability to convert feed to nutrients. They gained weight more rapidly than calves not fed yeast.
Livestock and Forage Research, El Reno, Okla.
W. A. Phillips, animal nutritionist, (405) 262-5291.

CROSSBRED COWS LIVED 1.4 YEARS LONGER IN THE HERD and were more fertile than purebred cows in studies conducted in the 1960's and 1970's, according to analysis completed in 1984. Angus, Shorthorn, and Hereford cows lived an average of 8.4 years in herd; reciprocal crosses of these breeds averaged 9.7 years and had offspring that were 14 percent heavier than purebred calves.
University of Nebraska, Lincoln, Nebr.
L. Cundiff, geneticist, (402) 762-3241.

FINNRACE, AN IMPORTED BREED OF SHEEP, can greatly increase lamb production over domestic breeds. Ewes with 1/4 to 1/2 Finnrace blood produced 18 and 29 percent more lambs, respectively, than their Rambouillet, Targhee, and Columbia

ANIMAL RESEARCH (continued)

counterparts when flock-mated to Suffolk rams. The higher production was sustained throughout a typical productive lifetime of 7 years.
U.S. Sheep Experiment Station, Dubois, Idaho.
C. Parker, animal physiologist, (208) 374-5306.

A COMMON WEED IS A PRIME SUSPECT IN CATTLE ABORTIONS occuring during the spring in Louisiana and Texas. Laboratory studies must still confirm the field findings: narrowleaf sumpweed caused abortions in rabbits, and cattle aborted after grazing on land harboring the weed in the two states. The weed, which also grows in Arkansas and Oklahoma, may be most toxic during its early seedling stage when it grows rapidly.
Veterinary Toxicology and Entomology Research, College Station, Tex./Texas A&M University.
L. D. Rowe, veterinary medical officer, (713) 260-9342.

A COMPUTER MODEL OF A DAIRY FORAGE SYSTEM can be used to evaluate new technology and management strategies on farms feeding alfalfa and corn. The model estimates factors such as crop yield, production costs, and net return. It can also assess the impact of new forage conservation methods under a wide range of conditions.
Fruit and Vegetable Harvesting Research, East Lansing, Mich.
C. A. Rotz, agricultural engineer, (517) 353-1758.

GERM-FREE PIGS AND CALVES begin life in a special "delivery room" in Ames, Iowa, to make sure they have a clean bill of health in research seeking to overcome diseases such as dysentery and diarrhea. The first germfree animal was born at Ames in 1973; since then, about 100 pigs and 24 calves a year have been delivered germ-free and the delivery has widened to other animals—from ducks and turkeys to mice, rats, and guinea pigs.
National Animal Disease Center, Ames, Iowa.
P. Matthews/S. Whipp, veterinary medical officers, (515) 239-8200.

A NOTORIOUS WEED, QUACKGRASS, MAY GET A NEW REPUTATION as one of the most nutritious and palatable grasses for livestock. Utilizing its aggressive spreading by breeding it with bluebunch wheatgrass, which is drought resistant, ARS scientists bred a new hybrid that, besides satisfying livestock appetites, is a good candidate for controlling erosion on meadows and pastures in northern states and also seems well adapted to saline sites in states like Montana. It is expected to be available commercially within two years.
Forage and Range Research, Logan, Utah.
K. H. Asay, plant geneticist, (801) 750-3069.

INTRODUCING BENEFICIAL GENES into livestock may someday depend on a scientist's ability to view nuclei in embryos shortly after fertilization. Centrifuging cow and pig embryos at more than 15,000 times gravity caused the sedimentation of dense materials in the ova and allowed for the first time the visualization of cell nuclei. Further, the embryos were undamaged by the treatment, and healthy pigs have been born when centrifuged embryos injected with genes were transferred into surrogate mothers.
Reproduction Laboratory, Beltsville, Md.
R. Wall, animal physiologist, (301) 344-2362.

ARS Quarterly Report - p. 10

RESOURCES AND ENVIRONMENTAL RESEARCH

NO-TILL WITH SURFACE RESIDUES MAY BE FEASIBLE ON THE STEEPEST CORN-BELT SOILS. Chisel plowing, paraplowing, and no plowing were tested for the first time on slopes as steep as 18 percent at Coshocton, Ohio. The purpose of the six-year conservation tillage study: to evaluate yields of corn and soybeans as well as fertility; disease; pests; machinery; and losses of water, soil, and chemicals on steep watersheds.
ARS North Appalachian Experimental Watershed, Coshocton/Ohio Agricultural Research and Development Center, Wooster, Ohio.
C. Amerman, hydrologic engineer, (614) 545-6349.

STRIPMINE SPOILS CAN BE RETURNED TO PRODUCTIVE LAND by revegetating them with two forages--thickspike wheatgrass and fourwing saltbush. Both grasses have passed preliminary tests by germinating well in salt solutions similar to those of soil and mining spoil in the Northern Great Plains. Also, fourwing saltbush, a weed which grows on millions of acres from western North and South Dakota and Kansas to eastern Oregon and Washington, was found to fill a very important void in cattle diets by providing them with more protein, phosphorus, and carotene than most range grasses, especially in winter.
Irrigation, Drainage, and Salinity Research, Mandan, N. Dak./
Agricultural/Surface-Mined Hydrology Research, Fort Collins, Colo.
R. Ries, range scientist, (701) 663-6448.

PLANT DAMAGE FROM DROUGHT IS SHARPLY INCREASED when plants are also exposed to air pollution. A Beltsville team of hydrologists and plant physiologists found that soybean yields were much lower when plants were subjected to a one-two punch of drought plus air pollution than were the combined yield decreases of soybeans exposed to each stress separately.
Plant Stress Laboratory, Beltsville, Md.
E. H. Lee, plant physiologist, (301) 344-3143.

ESTIMATING THE COST OF SOIL EROSION is difficult because all parts of a field do not erode uniformly. Much of the soil from one part of a field is often deposited on another when it rains. Results of a new cooperative agreement between ARS and Purdue University to study field variability should make future estimates of the erosion costs much more accurate.
National Soil Erosion Laboratory, West Lafayette, Ind.
H. Barrows, soil scientist, (317) 494-8685.

WIND EROSION, A SEVERE PROBLEM ON COARSE-TEXTURED SEMIARID SOILS, can be controlled using the right combination of residue management, proper tillage, and wind barriers. Dryland crop yields may be increased by covering the soils with vegetative mulches to increase needed organic matter or by deep tillage every two or three years to increase water infiltration.
Wind Erosion and New Crops Research, Lubbock, Tex.
D. Fryrear, agricultural engineer, (915) 263-0293.

NO-TILL IS A VIABLE ALTERNATIVE TO CONVENTIONAL TILLAGE for swelling heavy clay soils like those of the Blackland Prairie of Texas. A four-year study comparing the effects of tillage on soil properties and on wheat, grain sorghum, and cotton yields showed both systems gave the same yields with no adverse effect on these highly erodible soils.
Soil and Water Resources, Temple, Tex.
J. E. Morrison, agricultural engineer, (817) 774-1201.

RESOURCES AND ENVIRONMENTAL RESEARCH (continued)

LEAVING CROP RESIDUES ON THE SURFACE OF SOILS in the Southern Great Plains and using conservation tillage increased soil water during fallow, which in turn increased yields of subsequent crops. Conserving water from rainfall saves water needed for irrigation, which, along with higher yields, makes an economic crop production system that also saves precious dwindling groundwater supplies in the Ogallala Aquifer.
Conservation and Production Research Laboratory, Bushland, Tex.
P. Unger, soil scientist, (806) 735-6738.

SPACE SHUTTLE RADAR MEASURED MOISTURE BENEATH GROWING CROPS as the U.S. Challenger passed 140 miles above farms near Fresno, Calif. Highly specialized radar measured water in soil down to six inches below the surface. Although it may be a decade before such a system is in widespread use, it should eventually be possible to produce daily soil moisture maps to guide farmer decisions.
Hydrology Laboratory, Beltsville, Md.
T. Engman, hydrologist, (301) 344-3490.

A NEW TREE FOR WINDBREAKS HAS BEEN RELEASED in the Central and Northern Great Plains. Oahe, a hackberry tree with a better rate of survival and growth than common varieties, is suited to well-drained soil in farmstead plantings for controlling soil erosion. It may replace the popular Siberian elm, which is dying from herbicides, disease, and winterkill.
Forage, Range, and Shelterbelt Research, Mandan, N. Dak.
R. Cunningham, plant geneticist, (701) 663-6448.

ARS HAS DEVELOPED A NEW TECHNIQUE for monitoring residues of the pesticide atrazine that can detect parts per trillion. The technique can be applied to a dozen other herbicides and will prove invaluable for tracing pesticides in water, soil, food, and feed.
Central Great Plains Research Station, Akron, Colo.
B. Dunbar, (303) 345-2259.

RUNOFF AND SOIL LOSSES WERE SIGNIFICANTLY LOWERED by winter cover crops and reduced tillage during a six-year study of grain corn and silage corn grown on Missouri claypan soil. Average annual values for crop or management factors derived from soil losses and rainfall data ranged from 11 to 57 percent of currently accepted values.
Watershed Research, Columbia, Mo.
R. Wendt, soil scientist, (314) 875-5331.

COFARM, A COMPUTER MODEL for efficient soil and crop management, can be used by farmers and researchers for organizing and storing data for individual fields, soils, and crops. COFARM can simulate the effects of different management practices and help farmers make decisions on fertilizing, tillage, drainage, residue management, and similar activities.
Soil and Water Management Research, St. Paul, Minn.
M. J. Shaffer, soil scientist, (612) 373-1444.

RESOURCES AND ENVIRONMENTAL RESEARCH (continued)

NO-TILL SOYBEANS GROWN ON CLAY BLACKLAND PRAIRIE SOILS in Mississippi reduced erosion but also reduced yields and net returns. ARS scientists have found a possible link between surface residue and stem canker disease of soybeans. Double-cropped wheat and soybeans, on the other hand, proved an excellent conservation system that is much more profitable than any of the one-crop soybean systems evaluated.
Corn Protection Research Laboratory, Mississippi State, Miss.
J. O. Sanford, agronomist, (601) 325-2350.

AN EXPERIMENTAL NO-TILL DRILL for planting small grains is the first such machine able to place fertilizer—in liquid or solid form and in any combination—either with the seed or "banded" below the seed. Crops planted with the no-till drill in paired rows proved more vigorous than conventionally seeded and fertilized rows planted the same day.
Land Management and Water Conservation Research, Pullman, Wash.
L. Elliott, microbiologist, (509) 335-1551.

SUBSURFACE DRAINAGE SYSTEMS CAN AID SOIL CONSERVATION in low-lying areas of the South with high water tables and high rainfall. High water tables increase runoff, soil erosion, and plant nutrient losses—especially during the rainy months in winter and spring—and inhibit crop production and mobility of farm machinery. Draining some of this groundwater can alleviate the problem.
Soil and Water Management Research, Baton Rouge, La.
C. Carter, agricultural engineer, (606) 258-2683.

SOIL EROSION WAS REDUCED 70 PERCENT UNDER CONSERVATION TILLAGE as compared with conventional tillage during 11 years of testing in Mississippi. Tests also showed that conservation tillage increased cotton seed yield and decreased runoff.
USDA Sedimentation Laboratory, Oxford, Miss.
C. Mutchler, hydrologic engineer, (601) 234-4121.

WIND-GENERATED ELECTRICITY FOR PUMPING irrigation water in the Great Plains can reduce the amount of electricity purchased while maintaining the farmer's ability to provide crops with water at critical growth stages. In trials, two wind turbines provided 77 percent of the energy consumed by a center pivot and irrigation pump and also provided some excess power each month.
Wind Powered Irrigation Research, Bushland, Tex.
R. N. Clark, agricultural engineer, (806) 378-5734.

HUMAN NUTRITION RESEARCH

TOO MUCH SALT AND NOT ENOUGH POTASSIUM IN U.S. DIETS may be increasing the chances of Americans getting high blood pressure. Results of a year-long study of 28 men and women show they are eating nearly double the amount of sodium in relation to potassium when a safe and adequate intake should be reversed--0.6 sodium to 1.0 potassium.
Vitamin and Mineral Nutrition Laboratory, Human Nutrition Research Center, Beltsville, Md.
Jim Smith, chemist, (301) 344-2417.

ARS Quarterly Report - p. 13

HUMAN NUTRITION RESEARCH (continued)

VITAMIN B_6 RELIEVES THE SYMPTOMS OF SICKLE CELL ANEMIA, an inherited blood disease affecting about 50,000 black Americans. Working with a physician at Columbia University, New York, ARS scientists found that patients given two 50-mg doses of the vitamin daily had less frequent and severe attacks of the disease.
Vitamin and Mineral Nutrition Laboratory, Human Nutrition Research Center, Beltsville, Md.
R. Reynolds, chemist, (301) 344-2459.

A HIGHER RATIO OF POLYUNSATURATED FATS IN DIETS can help lower blood pressure. Hypertension—chronic high blood pressure—increases the risk of heart attack and stroke and affects one out of every five Americans over the age of 25. By increasing their intake of polyunsaturated fats by 6 to 7 percent, 40-to 60-year-old men and women with normal or slightly high blood pressure lowered their blood pressure, regardless of their saturated fat intake.
Western Regional Research Center, Berkeley, Calif.
J. Iocono, director, (415) 556-9699.

CHOLESTEROL INHIBITORS HAVE BEEN ISOLATED AND IDENTIFIED in barley and oats. When these fractions were fed to chickens at concentrations of 25 parts per million, levels of cholesterol-bearing, low-density lipoproteins in chickens' blood plasma decreased by 40 percent, as compared with those of chickens fed a control diet of mainly corn. The inhibitors may someday be added to human foods to decrease the risk of heart disease.
Cereal Crops Research Unit, Madison, Wis.
D. Peterson, horticulturalist, (608) 262-3355.

SYNTHETIC SUGAR USED TO TREAT LIVER DISEASE can be made at less expense from whey, a cheesemaking byproduct. The new process could lower the cost of making lactulose and make it available for a wide range of food and drug uses and as a noncaloric sweetener. Lactulose is used to treat adverse brain effects from advanced liver disease, known as portal systemic encephalopathy or hepatic coma, which, if left unchecked, can lead to coma and death.
Food Chemistry Research, Eastern Regional Research Center, Phildelphia, Pa.
K. Hicks, chemist, (215) 233-6458.

BRAN ABSORBS MINERALS as it passes through the human digestive tract. Excessive amounts of wheat bran can remove enough calcium from the GI tract to cause a negative calcium balance. Dry-milled corn bran has been shown to bind more calcium, copper, iron, and zinc than it contained before it was ingested.
Cereal and Food Biochemical Research, Northern Regional Research Center, Peoria, Ill.
F. A. Dintzis, chemist, (360) 671-4011.

BITTERNESS IN CITRUS JUICES CAN BE REMOVED by passing them through a column packed with immobolized bacterial cells. A key step was isolating the bacteria able to metabolize limonoids which cause the bitterness. Commercial development of this simple debittering process could save the California citrus industry alone about $8 million. It should be available commercially in three to five years.
Fruit and Vegetable Research, Pasadena, Calif.
S. Hasegawa, chemist, (213) 681-7294.

HUMAN NUTRITION RESEARCH (continued)

COMMERCIALIZATION OF A NEW PROCESS to produce partially defatted almonds may open new markets for the U.S. crop. In the process, almonds are pressed to remove 55 percent of the oil, expanded in hot water containing dextrose, and then salted and roasted in hot oil. After roasting, the nuts still contain 45 percent less oil than the unprocessed almonds.
Food Products Research, Southern Regional Research Center, New Orleans, La.
J. Pominski, chemical engineer, (504) 589-7012.

STRAWBERRIES PRODUCE A COMPOUND that can be formulated into a fumigant against aphids on lettuce and thrips on strawberries. The compound--ethyl formate--can be used as a fumigant on packaged lettuce and strawberries in a partial vacuum. It leaves no residue and also destroys insect pests on dried fruits. If approved as a fumigant, ethyl formate could aid the U.S. export of lettuce and strawberries to countries with restrictions on residue levels of fumigants.
Horticultural Crops Research, Fresno, Calif.
J. M. Harvey, plant pathologist, (209) 487-5334.

BRAN SPAGHETTI SCORES HIGHER IN PROTEIN AND MINERALS. Dietary fiber in spaghetti is increased threefold if 10 percent bran is added in making pasta. Bran also increases by about 40 percent protein, iron, calcium, manganese, phosphorus, and zinc in the spaghetti, which is inherently low in sodium, fats, and simple carbohydrates and contains a high level of complex carbohydrates.
Hard Red Spring and Durum Wheat Quality Laboratory, Fargo, N.D.
V. L. Youngs, food technologist, (701) 237-7728.

COMMERCIAL APPLICATION OF RESEARCH/POSTHARVEST TECHNOLOGY

APPLE PROCESSORS AND EXPORTERS NO LONGER NEED TO DIP FRUIT IN CHEMICALS to control storage scald, an unsightly brown surface skin condition. Virtually scald-free fruit can be had by just storing it in a controlled environment of 1 percent oxygen and 1 percent carbon dioxide.
Production, Harvesting, and Handling of Tree Fruits Research, Wenatchee, Wash.
K. Olsen, plant physiologist, (509) 662-4317.

IRRADIATING APPLES TO CONTROL CODLING MOTHS is being tested as an alternative to fumigation. Apples are being irradiated at low levels for different time periods and at varying doses when insects are in the young, middle-aged, and mature larval stages.
Crops Protection Research, Yakima, Wash.
A. Burditt, entomologist, (509) 575-5956.

AN ELECTRONIC EGG MAY HELP LOWER BREAKAGE losses by detecting the forces being exerted against the shells of real eggs during mechanized grading and packing. About seven percent of U.S. eggs crack during the largely automated journey from hen to market. If egg breakage could be reduced by just one percent, about $20 million yearly could be saved, provided half of these could be salvaged and used for other purposes.
Food Protection and Processing Research, Richard B. Russell Agricultural Research Center, Athens, Ga.
J. A. Dickens, engineer, (404) 546-3132.

ARS Quarterly Report - p. 15

COMMERCIAL APPLICATION OF RESEARCH/POSTHARVEST TECHNOLOGY (continued)

A NEW HYBRID DIESEL FUEL, made from crude vegetable oil, will be engine-tested as an alternative fuel for farm tractors. Developed by a new process that converts the vegetable oil to diesel fuel without altering its chemical structure, the new fuel remains clear, stable, and usable at low temperatures, is free of corrosive emulsifiers, and can be blended with other fuels on farms.
Exploratory Organic Reactions Research, Northern Regional Research Center, Peoria, Ill.
A. Schwab, chemist, (309) 685-4011.

FABRIC FINISHES LIKE DURABLE PRESS can now by improved because of a more direct method of analyzing tiny, individual particles on cotton fibers. The new method uses advanced technology (scanning electron microscopy and energy dispersive x-ray analysis) instead of the customary mechanical means or solvents to remove particles for further study.
Fiber and Yarn Technology Research, Southern Regional Research Center, New Orleans, La.
G. Louis, textile engineer, (504) 589-7586.

X-RAY ANALYSIS OF GRAIN KERNELS CAN DETECT HIDDEN INSECTS and tell whether larvae are dead or alive. Video film enlargement of x-ray scans reveals insect eggs and pupae that are too small for currently available detectors. Such image analysis may someday be computerized to automatically count the number of insects in a sample, a technique that will help to improve inspection standards and procedures.
Engineering Research, Western Regional Research Center, Albany, Calif.
T. Schatzki, chemist, (415) 486-3701.

UNPALATABLE FLAVORS IN GRAINS CAN BE REMOVED with a treatment that inactivates two enzymes responsible for the off-flavor. Treated common cereal grains retain their germ, remain rich in protein, vitamins, and minerals, and can be milled into shelf-stable, high-fat flour, whose texture and properties equal those of fresh or degerminated flours.
Field Crops Postharvest Research, Northern Regional Research Center, Peoria, Ill.
G. Bookwalter, food technologist, (309) 685-4011.

A MILD COTTON-CURING PROCESS THAT ADDS DURABLE PRESS QUALITIES to fabrics without using formaldehyde or its derivatives has attracted the interest of several major companies. The process has become attractive because of anticipated tightening of regulations by the U.S. Environmental Protection Agency that could eliminate certain formaldehyde uses because of potential cancer concerns.
Polymer Products Research, Southern Regional Research Center, New Orleans, La.
C. Welch, chemist, (504) 589-7062.

A FAST, NONDESTRUCTIVE METHOD for measuring the concentration of individual simple sugars--like glucose, fructose, and sucrose--in aqueous solutions has been developed using optical radiation in the near infrared region. The method has potential value as a quality-control procedure in food processing.
Quality Evaluation Research, Richard B. Russell Agricultural Research Center, Athens, Ga.
F. Meredith, chemist, (404) 546-3156.

COMMERCIAL APPLICATION OF RESEARCH/POSTHARVEST TECHNOLOGY (continued)

COTTON BATTING TREATED WITH BORIC ACID was better protected against smoldering in ARS tests than the foam presently used by furniture manufacturers. Peak surface temperatures also were lower for batting than for foam.
Special Products Research, Southern Regional Research Center, New Orleans, La.
D. J. Donaldson, chemist, (504) 589-7561.

NEWLY DISCOVERED GENES OPEN WAY TO LONGER SHELF LIFE for soybean oil products. Breeding the new genes into soybean varieties would help curb off-flavors and objectionable odors caused by the breakdown of unsaturated fatty acids. Soybean oil is used in margarines, salad dressings, and cooking oil.
Plant Science Research, West Lafayette, Ind.
J. R. Wilcox, geneticist, (317) 494-4772.

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THURSDAY, MARCH 20, 1986.

COOPERATIVE STATE RESEARCH SERVICE

WITNESSES

DR. ORVILLE G. BENTLEY, ASSISTANT SECRETARY, SCIENCE AND EDUCATION

JOHN PATRICK JORDAN, ADMINISTRATOR, COOPERATIVE STATE RESEARCH SERVICE

CLARE I. HARRIS, ASSOCIATE ADMINISTRATOR, COOPERATIVE STATE RESEARCH SERVICE

WILLIAM D. CARLSON, ACTING ASSOCIATE ADMINISTRATOR, OFFICE OF GRANTS AND PROGRAM SYSTEMS

STEPHEN B. DEWHURST, BUDGET OFFICER, UNITED STATES DEPARTMENT OF AGRICULTURE

Mr. WHITTEN. We have with us now the Cooperative State Research Service. We have Dr. Jordan, Dr. Harris, Dr. Carlson and, of course, the standby, Mr. Dewhurst.

We have several questions and anything you care to volunteer be sure to include it in the record. Your statement will be printed in its entirety in the record and also please submit any biographical sketches for witnesses that have not appeared before.

[CLERK'S NOTE.—The Cooperative State Research Service explanatory notes appear on pages 759 through 826.]

COOPERATIVE STATE RESEARCH SERVICE

Statement of Dr. John Patrick Jordan, Administrator of the Cooperative State Research Service (CSRS) before the House Subcommittee on Agriculture, Rural Development, and Related Agencies.

Mr. Chairman and Members of the Subcommittee: As this Subcommittee is well aware, the Cooperative State Research Service is the agency of the USDA through which federal research funding and coordination are accomplished on behalf of the Department of Agriculture, in cooperation with all of the State and Territorial Agricultural Experiment Stations; the Colleges of 1890, including Tuskegee University; all of the forestry schools; and all of the Colleges of Veterinary Medicine in the United States.

In addition to land-grant universities, there are other universities, not of the land-grant model, which are participants in the system, but we trace our history from the Hatch Act of 1887, establishing Agricultural Experiment Stations across the length and breadth of this nation. During that hundred years of history, we have witnessed the harnessing of science for the resolution of real-world problems in agriculture, food and forest sciences, and provided the technical basis upon which American agriculture became the envy of the world. Several characteristics of the system have been paramount in achieving that goal.

First of all, it involved the great agricultural learning centers in America and decision making at the State level; it involved the direct input in the priority setting process of the State legislators; it involved mobilizing basic research scientists to work on very practical problems, bringing forth real-world solutions; it involved leveraging funds by providing a requirement to match the federal dollars, a requirement which is so far surpassed as to make it a non-issue.

The rate of scientific impact and its changing effect on agriculture has been most evident during the last quarter century. During that time, the McIntire-Stennis program was instituted and research became an important component of the Colleges of 1890.

The Department has provided you with reports in the Explanatory Notes on the results of both the Competitive and the Special Research Grants, in addition to a quarterly report on accomplishments under the Competitive Research Grants program. Fiscal Year 1985 was the first year for the expanded Competitive Grants program with its new dimensions particularly evident in biotechnology, animal science, and pest science. The quality of proposals in all three of these areas was extremely high. We received many more proposals than we were able to fund. In 1985, there were a total of 2,153 proposals requesting $493 million and we could only fund 449 grants for $44 million.

We are certain that only the very best of these proposals survive the peer review process because many of the 350 reviewers used in the process have experience in both the NSF and NIH system and they have found our system to be as competitive as that of any agency of the federal government.

REPORT OF SELECTED SIGNIFICANT ACCOMPLISHMENTS

Mr. Chairman, we are excited about the advances that will be made with the new biotechnologies and I want to share with you the basis for that excitement. As this committee is well aware, vesicular stomatitis is a highly contagious disease of cattle, the symptoms and rapid spread of which are often identical with foot and mouth disease. It is critical for this nation to have a rapid diagnostic test that can be accomplished in the field. Using biotechnology research techniques, scientists at Washington State University have developed such a new diagnostic test that can be used to identify a vesicular stomatitis outbreak under field conditions in less than six hours. Scientists also have developed a new vaccine which provides an immunity for much longer duration than previous vaccines did. This is an important development for the livestock industry of America.

Furthermore, these same scientists have developed a new technology to produce monoclonal antibodies without the use of purified antigens either in the immunization phase or in the screening phase. This is a very significant breakthrough since the separation, purification, and isolation of antigens is extremely difficult and is the major constraint in utilizing monoclonal antibody techniques for the development of specific diagnostic tests, vaccines or therapeutic agents. This could lead to a much more rapid development of new diagnostic tests and vaccines for a variety of infectious diseases which has not been possible because of the inability to develop purified antigens.

One of the most effective technologies to emerge from biotechnology has been that of monoclonal antibodies, which are important in both the plant and animal agricultural industries. Let me quickly summarize for you what is involved.

Monoclonal antibodies are the result of researchers manipulating a process that occurs naturally in all animals -- the process of fighting disease. To produce monoclonal antibodies, researchers infect a mouse with a specific antigen -- it may be a virus, bacterium, parasite or any molecule that causes an animal to make antibodies. The mouse's spleen cells, which produce antibodies to the antigen, are fused with mouse cancer cells in a test tube. The resulting hybrid cell combines the ability of spleen cells to make antibodies with a cancer cell's ability to reproduce indefinitely. Each monoclonal antibody helps a scientist to diagnose disease by recognizing one and only one antigen in an organism (virus, bacterium) which is an asset since organisms contain many antigens.

The same thing can be done in plants, and one of the most dramatic is the use of monoclonal antibodies to detect the presence, and track changes in the yellow dwarf virus of wheat, a destructive virus worldwide. The monoclonal antibodies not only detect the presence of specific virus strains rapidly in varying backgrounds, but can be used in a predictive manner to help control the disease. Similarly, monoclonal antibodies are used to detect pathologic types of the maize dwarf mosaic virus of corn, and eliminate seed borne viruses in soybeans.

As this subcommittee is painfully aware, American agriculture faced a difficult year in 1985 and is facing yet another one this year. Both the Executive and Legislative branches of government have grappled with this very difficult situation and tried to chart the course for the future. The universities and other parts of the agricultural research system have provided some very meaningful and useful support to meet this crisis, support that has been delivered to the farmer/rancher of America through the Extension Service. One

effort was the publishing of a book entitled "The Organization and Performance of the U.S. Food System" which addresses several major issues facing American agriculture.

Another area which USDA and the universities have been examining involves new and alternative crops. An emerging role for plant and forest products is industrial applications -- which could mean new markets for farm products and domestic sources of raw materials to replace imports. Fourteen alternative crops are receiving increased attention.

USDA's role in this effort is to provide technical expertise and build bridges among the production, processing and marketing sectors. The private sector must identify the most promising markets, but no one firm has the overall interest in establishing new domestic industries that utilize more U.S. grown farm and forest products.

BUDGET RECOMMENDATION

The budget recommendation for CSRS for FY 1987 is $246,356,000. We are fully appreciative of the overwhelming need to reduce spending in the federal government, but this budget continues to reflect strong support for the State-Federal partnership in food and agricultural research. It resembles the request for FY 1986 in terms of supporting the base funded programs related to the Hatch, McIntire-Stennis, and Evans-Allen Acts. The figures are all parallel to the actual appropriated levels for FY 1986. The funding of these programs has a high priority because when combined with State funding, the basic

laboratory facilities, scientists, graduate students, and support necessary for the long-term stability of agricultural research are provided. These programs allow maximum flexibility at the station level to support research of the highest priority and at the same time assure the continued strong working relationship between the USDA and the State Agricultural Experiment Station system.

It is recommended that funding for the 1890 research facilities program be continued at the FY 1986 level. This will provide the fifth year of funding for a five-year $50 million grant program to upgrade facilities at these institutions. It would bring the total to $49,880,000 over the five year period.

The Competitive Research Grants program is also considered high priority with 1987 funding close to the fiscal 1986 level. The program was expanded significantly in 1985 in biotechnology, animal science, and pest science. We believe that this high priority program will encourage traditional, as well as new cooperators to conduct fundamental research which will be applicable to the needs of the farmers and ranchers of America.

As part of the Administration's overall spending reduction package, no funding has been recommended for the Special Research Grants program. These grant programs have concentrated on problems of local, State and national interest beyond the normal emphasis in the formula programs. Due to the discretionary nature of the Hatch Act formula and related base funded programs, amounts allotted to State institutions permit the institutions to fund research in those areas that they identify as high priority. This flexibility can provide for

maintaining the highest priority programs without the need for special earmarked funds.

In fiscal year 1985, the Higher Education program was transferred to the Cooperative State Research Service. Three higher education programs are conducted -- the Morrill-Nelson Permanent Appropriation which provides $50,000 to every State and Territory; Strengthening Grants to support resident instruction programs at historically Black land-grant institutions; and Graduate Training Grants awarded to colleges and universities to stimulate the development of food and agricultural scientific expertise in targeted national need areas.

The fiscal year 1987 budget proposes no funding for the Morrill-Nelson program or for Graduate Training Grants. Support for the development of agricultural expertise will continue to be provided indirectly through the provisions of the Hatch Act formula and related base funded programs and the Competitive Research Grants program. Strengthening Grants are recommended for the Colleges of 1890 and Tuskegee University at the current level.

PLANNING

The system broke new ground in FY 1986, which will have significant impact in FY 1987. As you know, Mr. Chairman, the experiment station system in concert with CSRS, sponsored a major symposium on planning in June 1985. This symposium concentrated on key problem areas needing to be addressed in great detail by the system. The hand-out packet includes a copy of the Proceedings of that

conference. That step was followed in August by a workshop designed to give major participants in agricultural research, extension, and teaching, including representatives from 35 of the land-grant universities of America an opportunity to work out details concerning research priorities. More than 650 commodity groups also provided comments on needed action. The workshop condensed more than a hundred high priority needs into 21 targeted areas. Specific objectives and cost analyses were a part of the workshop process. You have been provided with the results of that effort by your State Agricultural Experiment Station Director. Combined with the efforts in recent years by our sister agency, the Agricultural Research Service, it becomes the most massive planning and coordination effort ever undertaken in the history of agricultural research in America. The priorities that emerge are consistent with those identified by the Joint Council on Food and Agricultural Sciences and clearly indicate that the agricultural research system of America is on target in meeting the Nation's food, fiber and fuel needs. It also emphasizes that agricultural research in the university system of America is clearly a part of the solution, not a part of the problem in American agriculture. For this reason the Department and the Administration have put a high priority on maintaining agricultural research.

BIOTECHNOLOGY POLICY

Mr. Chairman, let's now turn our attention to one of the past year's most significant efforts involving agricultural research, extension and teaching. I specifically refer to the issue of forging a national policy for the conduct of biotechnology research. Assistant Secretary Orville Bentley has been a principal in the efforts of the Department of Agriculture with former Assistant

Secretary Ray Lett being the other principal. The resulting Department policy, which is being finalized with the Office of Science and Technology Policy, is predicated on four fundamentals:

- It is driven by the best science available.

- It recognizes that there is no fundamental difference between organisms that are genetically engineered and those developed through traditional breeding methods.

- It recognizes the absence of a track record for genetically engineered organisms which can be compared to that of the many years of natural breeding processes and proposes to establish that track record.

- It recognizes that human health and the environment must be safeguarded, but that research needs to progress under the umbrella of reasonable risk.

Based on these principles, the Department's research policy has been developed in concert with the National Science Foundation and the National Institutes of Health and is consistent with the policies of those agencies. Similarly, the regulatory component of the USDA policy is consistent with those of the Environmental Protection Agency and the Food and Drug Administration. Thus, Dr. Bentley and Mr. Lett, as members of the Biotechnology Science Coordinating Committee under the auspice of the Office of Science and Technology Policy, have worked diligently to assure the safety and efficacy of research in agriculture,

as well as to ensure the utility of the results of that research for American farmers and ranchers. The focus of this whole effort, Mr. Chairman, is to reduce input costs and to make American agriculture more competitive on a worldwide basis.

As of March 15, 1986, the U.S. Department of Agriculture using currently available resources has activated the National Biological Impact Assessment Program (NBIAP). Last year I reported to you on the goals of this important operation. The program is vital in assuring the efficacy and safety of biotechnology and of the use of genetic engineering in the agricultural industry of America. NBIAP provides an enormous inventory of talent that can be used to review proposals and protocols within proposals to assure safety and efficacy in biotechnology. It also provides an inventory of test sites that can be used to safely test biotechnologically developed crops, livestock, and related organisms. NBIAP will maintain a registry of biotechnology experiments and monitor materials being tested.

The whole effort, Mr. Chairman, is backed up by two important additions to the responsibilities of the Secretary of Agriculture as outlined in the 1985 Farm Bill. Specifically, the Secretary "shall establish appropriate controls with respect to the development and use of the application of biotechnology to agriculture;" and "coordinate the efforts of States, State cooperative institutions, State extension services, the Joint Council, the Users Advisory Board, and other appropriate institutions in assessing the current status of, and developing a plan for, the effective transfer of new technologies, including biotechnology, to the farming community, with particular emphasis on addressing the unique problems of small- and medium-sized farms in gaining information about those technologies."

Mr. Chairman, this concludes my prepared remarks. I will be pleased to answer any questions.

William D. Carlson
Acting Associate Administrator
Office of Grants & Program Systems

Dr. William D. Carlson is the Acting Associate Administrator of the Office of Grants and Program Systems (OGPS) and is Principal Veterinarian in the Cooperative State Research Service (CSRS). Dr. Carlson, on behalf of the Administrator of OGPS, provides administrative leadership to the Competitive Research Grants, Grants Administrative Management and the Higher Education Division of the Department of Agriculture. He provides administrative support for the Joint Council on Food and Agricultural Sciences, the National Agricultural Research and Extension Users Advisory Board and other special programs.

Dr. Carlson received a Doctor of Veterinary Medicine and a Masters of Science from Colorado State University. He received a Ph.D. from the University of Colorado Medical Center in Radiation Biology and Radiology. Dr. Carlson was founder of the Department of Radiology and Radiation Biology at Colorado State University that has enjoyed international recognition for its programs. Dr. Carlson was also president of the Colorado State University Research Foundation. He is an author of a major book in veterinary radiology, editor of a radiation biology book and author of many scientific publications. He served as President of The University of Wyoming for 11 years. At this time he served on many regional and national boards and commissions. He is the receipient of many honors including the "Veterinarian of the Year" for the United States.
Dr. Carlson most recently was honored by being selected as one of the 10 founding members of the Veterinary Medicine Division of the National Academies of Practice.

Dr. Carlson has been with the Department of Agriculture since 1984.

SPECIAL RESEARCH GRANTS, CRITICAL AGRICULTURAL MATERIALS, AND RANGELAND RESEARCH GRANTS

Mr. WHITTEN. What evidence does the Administration have to support the thesis that State institutions will continue some of the special research projects using their own funds?

Dr. JORDAN. The Experiment Station Committee on Organization and Policy which represents the Agricultural Experiment Station Directors, has conducted an intensive planning and priority setting process involving commodity groups, farm organizations, professional societies and others. The priorities, as reflected in their fiscal year 1987 budget request, include the restoration of national programs which have been funded as special research grants. It is in this context that we believe that the State institutions will use the discretionary nature of the Hatch Act and related base programs to continue progress on critical problems now being addressed through the Special Research Grants program.

Mr. WHITTEN. Are not most States also experiencing financial stress?

Dr. JORDAN. It is correct that many States are experiencing financial difficulties. This makes it essential for each State to allocate its available resources to the highest priority researchable problems.

Mr. WHITTEN. In this period of economic stress in the agricultural sector, do you not feel that we should be increasing our research efforts to help restore profitability of agriculture?

Dr. JORDAN. The agricultural research system has provided some very meaningful and useful support to meet the economic stress faced by the farmers and with increased efforts in this area will help to restore profitability to agriculture.

FISCAL YEAR 1987 BUDGET REQUEST

Mr. WHITTEN. Please provide for the record the fiscal year 1987 funding levels by program requested by CSRS, the levels the Department requested from OMB, and the OMB allowance.

[The information follows:]

COOPERATIVE STATE RESEARCH SERVICE—FISCAL YEAR 1987 BUDGET REQUEST

[In thousands of dollars]

Agency or item	1986 Estimate	1987 Estimate	Increase or decrease	1987 Agency	1987 Department
Cooperative State Research Service:					
Payments under the Hatch Act	155,545	155,545	0	179,857	163,682
Cooperative forestry research	12,975	12,975	0	15,953	13,653
Payments to 1890 Colleges and Tuskegee University	23,333	23,333	0	26,979	24,554
Special research grants	30,324	0	−30,324	60,273	14,785
Competitive research grants	44,233	42,425	−1,808	98,245	61,500
Animal health and disease research, Section 1433	5,725	0	−5,725	9,100	0
Federal administration (direct appro.)	1,612	150	−1,462	282	127
1890 Research Facilities	9,940	9,940	0	10,000	10,000
Higher Education	4,970	1,988	−2,982	7,000	5,000
Research Facilities Activities	0	0	0	50,000	0
Total, Cooperative State Research Service	288,657	246,356	−42,301	457,689	293,301

BIOTECHNOLOGY RESEARCH

Mr. WHITTEN. In last year's record you stated the volume and rapidity of the response to the request for research proposals revealed the importance of the biotechnology initiative and its applicability to the future of American agriculture. Yet, you requested no increase in funding for this initiative. Please provide for the record a listing of the biotechnology research efforts you have funded thus far, describing the objective of the research, the estimated cost of each effort, and the institution doing the work.

[The information follows:]

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - PLANT MOLECULAR BIOLOGY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of California Berkeley, CA 94720	Andrew O. Jackson	$240,000	09/01/85	08/31/87	Structure, Pathology, and Genetics of Barley Stripe Mosaic Virus
Univ. of California, San Diego La Jolla, CA 92093	Stephen H. Howell	$120,000	09/01/85	08/31/87	Stability of DNA Introduced into Plants
Univ. of California Los Angeles, CA 90024	R. B. Goldberg	$240,000	08/15/85	08/30/87	Regulatory Sequences Controlling Viral-induced Gene Expression in Tobacco
Stanford Univ. Stanford, CA 94305	Virginia Walbot	$170,000	09/15/85	09/30/87	Expression of Maize Mitochondrial Genome
Colorado State Univ. Ft. Collins, CO 80523	Craig C. Schenck	$124,731	09/15/85	09/30/87	Structure-Function Relationships in Chlorophyll Binding Proteins
Carnegie Institution of Washington 1530 P Street, N.W. Washington, D.C. 20005	William Thompson	$100,000	09/15/85	09/30/87	Photoregulated Gene Expression in Chloroplasts

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - PLANT MOLECULAR BIOLOGY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Florida Gainesville, FL 32611	Daryl R. Pring	$100,000	09/01/85	08/31/87	Cosmid Mapping of Mitochondrial DNA of Male Fertile and Male Sterile Sorghum
International Society for Plant Molecular Biology Athens, GA 30602	Leon Dure, III	$7,500*	09/01/85	02/28/86	First International Congress of Plant Molecular Biology
Univ. of Georgia Res. Fdn. Athens, GA 30602	Richard Meagher	$170,000	09/15/85	09/30/87	Expression of Soybean Nuclear Genes in Transgenic Plants
Univ. of Illinois Urbana, IL 61801	S. Kaplan	$200,000	09/15/85	09/30/87	Synthetic Deoxyoligonucleotide - Directed Analysis of Gene Control in Photosynthesis
Univ. of Illinois Urbana, IL 61801	Mary A. Schuler	$190,000	09/01/85	08/31/87	Plant Cytochromes P-450: Regulation of Gene Expression
Univ. of Kentucky Res. Fdn. Lexington, KY 40506	Arthur G. Hunt	$140,000	09/01/85	08/31/87	Gene Expression in Plants: A Characterization of Plant Polyadenylation Signals

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - PLANT MOLECULAR BIOLOGY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Kentucky Res. Fdn. Lexington, KY 40506	Robert J. Shepherd	$100,000	09/01/85	08/31/87	Complementation Among Caulimoviruses
Univ. of Michigan Ann Arbor, MI 48109	Jeffrey D. Palmer	$100,000	09/15/85	09/30/87	Repeated DNA Sequences and Chloroplast DNA Instability in Clover
Univ. of Minnesota St. Paul, MN 55104	Carolyn D. Silflow	$190,000	09/15/85	09/30/87	Tubulin Genes in Higher Plants
Washington State Univ. St. Louis, MO 63130	Ursula Goodenough	$150,000	09/15/85	09/30/87	Hydroxyproline-Rich Glycoproteins: Sequences, Interactions, and Evolution
Agricultural Research Service, USDA P.O. Box 225, Stoneville Road Stoneville, MS 38776	Kenneth C. Ehrlich	$100,000	09/15/85	09/30/87	Plant Proteins Involved in Regulating Gene Expression through DNA Methylation
Univ. of New Hampshire Durham, NH 03824	Anita S. Klein	$140,000	09/15/85	09/30/87	Tissue-specific Gene Regulation in Maize

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - PLANT MOLECULAR BIOLOGY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of North Carolina Chapel Hill, NC 27514	Ann G. Matthysse	$100,000	09/15/85	09/30/87	Characterization and Use of Agrobacterium Genes for Attachment to Plant Cells
Rutgers, The State Univ. New Brunswick, NJ 08903	Daniel F. Klessig	$110,000	09/15/85	09/30/87	Regulation of Pathogenesis-related Proteins Synthesis in Nicotiana
Cold Spring Harbor Laboratory P.O. Box 100 Cold Sprg. Harbor, NY 11724	Stephen Dellaporta	$124,000	09/01/85	08/31/87	Changes in Waxy Gene Activity by Excision of a DS Element
Cornell Univ. Ithaca, NY 14853	O. C. Yoder	$140,000	09/01/85	08/31/87	Transposable Elements in Filamentous Fungi
Cornell Univ. Ithaca, NY 14853	Maureen R. Hanson	$114,000	09/01/85	08/31/87	Regulation of Mitochondrial Gene Expression
Univ. of Oregon Eugene, OR 97403	William Sistrom	$50,289	09/15/85	09/30/87	Structure-Function-Relations in Chlorophyll Binding Proteins

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - PLANT MOLECULAR BIOLOGY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Texas A&M Res. Fdn. P.O. Box 3578 College Station, TX 77843	William D. Park	$190,000	09/01/85	08/31/87	Cis-Acting Factors Regulating the Expression of Patatin Genes of Potato
Virginia Polytechnic Inst. & State Univ. Blacksburg, VA 24061	Dennis R. Dean	$188,000	09/15/85	09/30/87	Genetic and Biochemical Analysis of the nifEN Genes and their Products from Azotobacter
Virginia Polytechnic Inst. & State Univ. Blacksburg, VA 24061	Kriton K. Hatzios	$70,000	09/15/85	09/30/87	Molecular Biology of the Enhanced Degradation of Thiocarbamate Herbicides by Soil Microorganisms
Washington State Univ. Pullman, WA 99164	Gynheung An	$145,000	09/01/85	08/31/87	Introduction of Useful Traits into Crop Plants by Genetic Engineering
Univ. of Washington Seattle, WA 98195	Arnold J. Bendich	$46,500	09/15/85	09/30/86	Genetic Transformation for Plant Mitochondrial Genes
Univ. of Wisconsin Madison, WI 53706	William Reznikoff	$110,000	09/01/85	08/31/87	Promoters Controlled by Anaerobiosis

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - PLANT MOLECULAR BIOLOGY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Wisconsin Madison, WI 53706	Richard A. Spritz	$130,000	09/15/85	09/30/87	RNA Processing of Higher Plants

TOTAL $4,100,000

* Total award amount of $10,000 was split-funded with Response to Biological Stress contributing the remaining $2,500.

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - ANIMAL MOLECULAR BIOLOGY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Auburn Univ. Auburn University, AL 36849	Rex A. Dunham	$61,500	09/15/85	09/30/87	Gene Transfer and Expression in Catfish via Gynogenesis
Stanford Univ. Stanford, CA 94305	Gary K. Schoolnik	$238,600	08/15/85	08/31/87	Moraxella bovis pili. Molecular and Genetic Studies
Colorado State Univ. Ft. Collins, CO 80523	B. J. Beaty	$100,000	09/15/85	09/30/87	Transposition of Genes into Mosquito Genomes to Control Vector Potential
Colorado State Univ. Ft. Collins, CO 80523	Ralph E. Smith	$100,000	09/15/85	09/30/87	Molecular Cloning of Avian Leukosis Viruses
Univ. of Florida Gainesville, FL 32611	Guy H. Palmer	$126,000	09/15/85	09/30/87	Development of a Bovine Leukemia Virus Subunit Vaccine
Univ. of Georgia Res. Fdn. Athens, GA 30602	Benjamin Brackett	$150,000	09/01/85	08/31/87	Use of Retroviral Promoters for Heterologous Gene Expression in Animals

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - ANIMAL MOLECULAR BIOLOGY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Iowa State Univ. of Science & Technology Ames, IA 50011	Carol M. Warner	$100,000	09/15/85	09/30/87	Molecular Analysis of the Chicken Major Histocompatibility Complex
Agricultural Research Service, USDA P.O. BOX 70, HR #2 Ames, IA 50010	Harley W. Moon	$79,000	09/01/85	08/31/87	Genetically Engineered Live Oral Pilus Vaccine for Postweaning *E. coli* Infection of Swine
Rush-Presbyterian-St. Luke's Medical Center Chicago, IL 60612	Thomas Schnitzer	$115,000	09/15/85	09/30/87	Molecular Basis of Avian Reovirus Disease
Univ. of Illinois Chicago, IL 60680	Katherine Knight	$105,000	09/01/85	08/31/87	Structure and Organization of Bovine Immunoglobulin Genes
Univ. of Illinois Urbana, IL 61801	Deoki N. Tripathy	$100,000	09/01/85	08/31/87	Fowlpox Virus as a Cloning Vector for Poultry Pathogens
Louisiana State Univ. & A&M College Baton Rouge, LA 70803	Ronald Montelaro	$100,000	09/15/85	09/30/87	EIAV Provirus: Structure, Expression, and Diagnostic Potential

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - ANIMAL MOLECULAR BIOLOGY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Amherst College Amherst, MA 01002	Richard Goldsby	$239,700	08/15/85	08/31/88	Cloning Bovine Ig Genes and their Use to Construct Functional Chimeric Molecules
Agricultural Research Service, USDA Room 227, Bldg. 003, BARC-West Beltsville, MD 20705	Joan K. Lunney	$146,500	09/01/85	08/31/87	Enhancement of Disease Resistance in Genetically Engineered Swine
Michigan State Univ. East Lansing, MI 48824	Leland F. Velicer	$102,000	09/15/85	09/30/87	Marek's Disease Herpesvirus Molecular Biology: Secretory Glycoprotein Gene Analysis
Agricultural Research Service, USDA 220 2nd Street South, 1st Floor Minneapolis, MN 55401	Larry D. Bacon	$101,700	09/15/85	09/30/88	Isolation and Analysis of Chicken MHC Class II Genes and Relation to Disease
Agricultural Research Service, USDA 220 2nd Street South, 1st Floor Minneapolis, MN 55401	Lucy F. Lee	$137,000	09/01/85	08/31/88	Transforming Genes and Gene Products of Oncogenic Marek's Disease Virus

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - ANIMAL MOLECULAR BIOLOGY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Agricultural Research Service, USDA 220 2nd Street South, 1st Floor Minneapolis, MN 55401	Lyman Crittenden	$90,000	09/01/85	08/31/87	Gene Transfer to the Germline of Chicken Using Retroviral Vectors
Agricultural Research Service, USDA 220 2nd Street South, 1st Floor Minneapolis, MN 55401	Robert F. Silva	$70,500	09/01/85	08/31/87	Bioengineering Avian Herpesviruses to Construct Live Recombinant DNA Vaccines
Univ. of Missouri Columbia, MO 65211	Kim S. Wise	$140,000	09/01/85	08/31/87	Immunologic and Molecular Genetic Determinants in Mycoplasmal Pneumonia of Swine
North Carolina State Univ. Raleigh, NC 27695	Todd Klaenhammer	$104,000	09/15/85	09/30/87	Transfer, Expression, and Clonng of Phage Resistance Genes in Lactic Streptococci
North Carolina State Univ. Raleigh, NC 27695	Walter Dobrogosz	$126,400	09/01/85	08/31/87	Plasmid Biology of Lactobacillus plantarum
Univ. of Nevada Reno, NV 89557	Stuart T. Nichol	$129,700	09/15/85	09/30/87	A Molecular Approach to Vesicular Stomatitis Epizootiology, Disease and Control

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - ANIMAL MOLECULAR BIOLOGY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Cornell Univ. Ithaca, NY 14853	Gary M. Dunny	$100,000	09/15/85	09/30/87	Bacteriophage Resistance in Dairy Streptococci
Columbia Univ. in the City of New York New York, NY 10027	Martin Chalfie	$102,000	09/01/85	08/31/87	Genetic and Molecular Analysis of Drug Resistance in Caenorhabditis elegans
Univ. of Cincinnati Cincinnati, OH 45221	Jeffrey Robbins	$100,000	09/01/85	08/31/87	Gene Regulation of the Major Muscle Protein, Myosin, in Domestic Poultry
Ohio State Univ. Res. Fdn. Columbus, OH 43212	D. N. Foster	$100,000	09/01/85	08/31/87	Isolation and Structural Organization of the Chicken Gonadotrophic Genes
Agricultural Research Service, USDA 600 East Mermaid Lane Philadelphia, PA 19118	Marvin Grubman	$70,000	09/15/85	09/30/87	Study of Foot-and-Mouth Disease Virus Assembly and Neutralizing Antigenic Determinants
Texas A&M Res. Fdn. College Station, TX 77843	James Womack	$147,000	09/01/85	08/31/87	Molecular and Somatic Cell Genetics: Mapping the Cattle Genome

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - ANIMAL MOLECULAR BIOLOGY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Washington State Univ. Pullman, WA 99164	Gary H. Thorgaard	$100,000	09/15/85	09/30/87	Gene Transfer in Fish by Sperm Chromosome Fragmentation and Gynogenesis
Washington State Univ. Pullman, WA 99164	William Cheevers	$144,000	09/01/85	08/31/87	Structure, Organization and Expression of the CAE Virus Envelope Gene
Washington State Univ. Pullman, WA 99164	T. Yilma	$140,000	09/01/85	08/31/87	A General Method for the Production of Polyvalent Vaccines in Vaccinia Virus Recombinants
Washington State Univ. Pullman, WA 99164	Anthony Barbet	$95,900	09/01/85	08/31/87	Development of a Recombinant DNA Derived Vaccine against Bovine Anaplasmosis
Washington State Univ. Pullman, WA 99164	Raymond Reeves	$100,000	08/15/85	08/30/87	Cloning of Cellular Genes Responsive to Infection and Transformation by BLV

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - ANIMAL MOLECULAR BIOLOGY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Children's Orthopedic Hospital & Medical Center 4800 Sand Point Way, NE Seattle, WA 98105	Stephen Moseley	$134,500	09/01/85	08/31/87	Genetic Organization and Function in the Production of the F41 Bacterial Adhesin
Univ. of Wisconsin Madison, WI 53706	Gary Splitter	$140,000	09/15/85	09/30/87	Characterization of the Bovine Major Histocompatibility Complex
Univ. of Wisconsin Madison, WI 53706	Richard Marsh	$145,000	09/01/85	08/31/87	Characterization of Scrapie Agent Nucleic Acid
	TOTAL	$4,381,000			

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - ANIMAL GROWTH & DEVELOPMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Arizona Tucson, AZ 85721	Darrel E. Goll	$150,000	09/15/85	09/30/87	Proteases Responsible for Muscle Protein Degradation and Their Role in Growth
Univ. of California Davis, CA 95616	Ransom Baldwin	$185,000	09/15/85	09/30/87	Quantitative Evaluation of Physiological and Metabolic Limits to Lactation
Univ. of California Davis, CA 95616	Kirk C. Klasing	$100,000	09/15/85	09/30/87	Role and Mode of Action of Interleukin-1 in Mediating Immunologic Stress
Colorado State Univ. Ft. Collins, CO 80523	Rupert P. Amann	$101,300	09/15/85	09/30/87	Control of Prepubertal Changes in Neuroendocrine Function in Bull Calves
Univ. of Connecticut Storrs, CT 06268	Hans Laufer	$100,000	09/01/85	08/31/87	Control of Reproduction in Shrimp, Prawns and Crayfish
Univ. of Florida Gainesville, FL 32611	Francis C. Davis	$175,400	09/15/85	09/30/87	Translational Regulation of mRNAs Synthesized During Oogenesis

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - ANIMAL GROWTH & DEVELOPMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Iowa State Univ. of Science & Technology Ames, IA 50011	C. M. Warner	$143,400	09/15/85	09/30/87	Role of the SLA Complex in Pig Development and Reproduction
Tufts Univ. Boston, MA 02111	V. Papaioannou	$122,000	09/15/85	09/30/87	Development and Viability of Micromanipulated Preimplantation Pig Embryos
Johns Hopkins Univ. Baltimore, MD 21205	John D. Gearhart	$150,000	09/15/85	09/30/87	Genetic and Developmental Consequences of Gene Transfer into Mouse Embryos
Univ. of Maryland College Park, MD 20742	Ian H. Mather	$90,700	09/01/85	08/31/89	Distribution and Biogenesis of Mammary Membrane Proteins
North Carolina State Univ. Raleigh, NC 27695	Ruth M. Shuman	$150,000	09/15/85	09/30/87	Gene Transfer and Tissue-specific Expression of Genes in Domestic Animals
Rutgers, The State Univ. Piscataway, NJ 08854	Rocco V. Carsia	$86,000	09/01/85	08/31/87	Molecular Biology of Stress Response at the Adrenocortical Cell Level

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - ANIMAL GROWTH & DEVELOPMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Health Research, Inc. Roswell Park Division & New York State Dept. of Health 666 Elm Street Buffalo, NY 14263	Garth R. Anderson	$153,900	09/15/85	09/30/87	VL30 Sequences as Anoxic Stress Response Genes
Cornell Univ. Ithaca, NY 14853	David B. Wilson	$121,600	09/15/85	09/30/87	Genetic Engineering of Acid Resistant, Cellulolytic, Rumen Bacteria
Cornell Univ. Ithaca, NY 14853	Dale E. Bauman	$185,000	09/01/85	08/31/87	Cellular and Metabolic Mechanisms Controlling Efficiency of Growth and Lactation
Ohio Univ. Athens, OH 45701	T. E. Wagner	$150,000	09/15/85	09/30/87	Mammary Specific, Germline, Genetic Delivery of a Lactogenic Growth Hormone(s)
The Wistar Institute 36th & Spruce Streets Philadelphia, PA 19104	Davor Solter	$150,000	09/15/85	09/30/87	Cloning in Mammals by Nuclear Transfer
Pennsylvania State Univ. University Park, PA 16802	Terry D. Etherton	$100,000	09/15/85	09/30/87	Regulation of Nutrient Utilization in Pigs by Porcine Growth Hormone

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - ANIMAL GROWTH & DEVELOPMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Pennsylvania State Univ. University Park, PA 16802	Craig Baumrucker	$100,000	09/15/85	09/30/87	IGF_1 Stimulation of Bovine Mammary Tissue Growth
Pennsylvania State Univ. University Park, PA 16802	Roy H. Hammerstedt	$100,000	09/01/85	08/31/87	Cryoprotection of Membranes
Pennsylvania State Univ. University Park, PA 16802	Frederick Ferguson	$100,000	09/15/85	09/30/87	Swine Natural Killer Cells: Cloning and Production of Monoclonal Antibodies
Texas A&M Res. Fdn. College Station, TX 77843	Thomas Welsh, Jr.	$100,000	09/01/85	08/31/87	Regulation of Corticotropin-releasing Factor (CRF) and Adrenocorticotropin (ACTH)
Univ. of Texas System Cancer Center M. D. Anderson Hospital and Tumor Institute Houston, TX 77030	Marsha L. Frazier	$150,000	09/15/85	09/30/87	Genes Coding for Insulin Immunoreactivity in Fetal Bovine Pancreas Development
Washington State Univ. Pullman, WA 99164	Lynette B. Corbeil	$124,200	09/15/85	09/30/87	Prevention of Stress Related Mastitis with Recombinant Bovine Interferon

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - ANIMAL GROWTH & DEVELOPMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Washington State Univ. Pullman, WA 99164-5045	Michael Griswold	$150,000	09/15/85	09/30/87	Bovine Testicular Transferrin
Univ. of Wisconsin Madison, WI 53706	Neal L. First	$161,500	09/15/85	09/30/87	Ontogeny and Control of Development of Bovine Preimplantation Embryos
	TOTAL	$3,400,000			

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - PLANT GROWTH & DEVELOPMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of California Berkeley, CA 94720	Bob B. Buchanan	$105,000	08/01/85	07/31/87	Developmental Studies on Thioredoxin-linked Regulatory Mechanisms in C_4 Plants
Univ. of California Berkeley, CA 94720	William C. Taylor	$83,000	09/15/85	09/30/87	Chloroplast Development Influences Nuclear Gene Expression
Univ. of California Los Angeles, CA 90024	E. M. Tobin	$188,000	08/15/85	08/31/87	Functional and Mutational Analysis of a Thylakoid Protein
Univ. of Florida Gainesville, FL 32611	G. A. Moore	$118,000	08/01/85	07/31/87	Genetic Transformation of Citrus to Facilitate Hybrid Production
Agricultural Research Service, USDA P.O. Box 5677 Athens, GA 30613	Carole L. Bassett	$85,000	09/01/85	08/31/87	Characterization of RNases Synthesized during Floral Development in Morning Glory
Univ. of Chicago Chicago, IL 60637	Laurens J. Mets	$114,000	08/01/85	07/31/87	Genetic Control of Cellular Differentiation in Leaves of a C4 Dicot

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - PLANT GROWTH & DEVELOPMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Illinois Chicago, IL 60680	C. W. Beecher	$50,000	08/15/85	08/31/87	Analysis of Secondary Metabolite Induction by NMR
Purdue Res. Fdn. West Lafayette, IN 47907	Brian A. Larkins	$130,000	09/01/85	08/31/87	Analysis of Seed Globulin Genes and their Expression in Cereals
Agricultural Research Service, USDA Rm. 227, Bldg. 003, BARC-West Beltsville, MD 20705	Jerry D. Cohen	$83,000	08/01/85	07/31/87	Characterization and Developmental Study of a Peptide Conjugate of IAA from Phaseolus
Michigan State Univ. East Lansing, MI 48824	Jan A. D. Zeevaart	$85,000	09/01/85	08/31/87	Genetic Control of Gibberellin Metabolism in Relation to Development in Tomato
Univ. of Minnesota St. Paul, MN 55104	Emily E. Hoover	$50,000	09/01/85	08/31/87	Regulation of Interspecific Seed Failure in Phaseolus
St. Mary's College Winona, MN 55987	Richard V. Knowles	$50,000	09/15/85	09/30/87	DNA Amplification in Zea mays Endosperm: Control and Relationship to Development

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - PLANT GROWTH & DEVELOPMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Washington Univ. St. Louis MO 63130	Paul P-C. Lin	$64,000	08/01/85	07/31/87	Genetic/Molecular Biololgy and Regulation of Polyamine Metabolism
Washington Univ. St. Louis, MO 63130	John C. Rogers	$100,000	08/01/85	07/31/87	Mechanisms Directing Hormonal and Developmental Regulation of Gene Expression in Barley
Montana State Univ. Bozeman, MT 59717	Richard G. Stout	$50,000	09/01/85	08/31/87	Mode of Action of the Phytotoxin Fusicoccin: An Immunological Approach
Univ. of New Hampshire Durham, NH 03824	Thomas D. Lee	$87,000	08/15/85	08/31/87	Fruit and Seed Abortion: Are they Related to Pollen Competition?
The Rockefeller Univ. New York, NY 10021	Anthony Cashmore	$175,000	08/01/85	07/31/87	Genetic Manipulation of Protein Import into Plant Mitochondria
Oregon State Univ. Corvallis, OR 97331	Carol J. Rivin	$102,000	09/15/85	09/30/88	Molecular Analysis of Embryo Development in Wild Type and vp Mutants of Maize

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - PLANT GROWTH & DEVELOPMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Oregon State Univ. Corvallis, OR 97331	Roy O. Morris	$165,000	08/01/85	07/31/87	Expression of Heterologous Cytokinin Biosynthetic Gene in Tobacco
Univ. of Oregon Eugene, OR 97403	Donald R. Hague	$103,000	09/01/85	08/31/87	Regulation of Pyruvate, Pi Dikinase in Maize
Gordon Research Conferences c/o Univ. of Rhode Island Gordon Research Center Kingston, RI 02381	Ronald L. Phillips	$6,000	06/01/85	11/30/85	Gordon Research Conference on Plant Cell and Tissue Culture
Texas A&M Res. Fdn. College Station, TX 77843	Craig L. Nessler	$85,000	07/15/85	07/31/87	Cell Specific Gene Expression during Laticifer Differentiation in Poppy
Univ. of Vermont & State Agric. College Burlington, VT 05405	Philip Lintilhac	$50,000	09/01/85	08/31/87	Developmental Patterning of Plant Callus Cultures with Mechanical Stimuli
Univ. of Washington Seattle, WA 98195	E. Van Volkenburgh	$67,000	09/15/85	09/30/87	Genetic Limitation of Leaf Growth

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - PLANT GROWTH & DEVELOPMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Wisconsin Madison, WI 53706	Chong-maw Cheng	$50,000	08/01/85	07/31/87	Molecular Control of Cytokinins on Plant Growth

TOTAL $2,225,000

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - RESPONSE TO ENVIRONMENTAL STRESS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Arizona Tucson, AZ 85721	Hans J. Bohnert	$141,000	08/01/85	07/31/87	Regulation of Gene Expression during CAM-Induction
Agricultural Research Service, USDA 800 Buchanan Street Albany, CA 94710	William J. Hurkman	$115,000	09/15/85	09/30/88	Identification of Membrane Proteins Responsible for Salt Tolerance
Univ. of California Davis, CA 95616	Carole P. Meredith	$110,000	09/15/85	09/30/87	Selection and Characterization of Mutants Resistant to Mineral Stress
Univ. of California Davis, CA 95616	M. A. Matthews	$144,000	08/01/85	07/31/87	Physiological Mechanisms of Plant Growth Inhibition by Low Water Potentials
Univ. of Florida Gainesville, FL 32611	Charles L. Guy	$119,000	09/01/85	08/31/88	Altered Gene Expression and Protein Synthesis in Spinach during Cold Acclimation
Iowa State Univ. Ames, IA 50011	Cecil R. Stewart	$101,000	09/01/85	07/31/87	Hormonal, Molecular, and Cellular Aspects of Stress Induced Proline Accumulation in Plants

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - RESPONSE TO ENVIRONMENTAL STRESS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Purdue Res. Fdn. West Lafayette, IN 47907	Paul Hasegawa	$150,000	08/01/85	07/31/88	Role of Ion Accumulation and Compartmentation in Salinity Adaptation of Cultured Cells
Purdue Res. Fdn. West Lafayette, IN 47907	David Rhodes	$110,000	08/01/85	07/31/87	Metabolism of Proline Accumulation in Relation to Salinity Tolerance in Plants
Purdue Res. Fdn. West Lafayette, IN 47907	Peter Goldsbrough	$151,000	08/01/85	07/31/88	Regulation of Protein Synthesis Induced by Cadmium in Plant Cell Cultures
Univ. of Massachusetts Amherst, MA 01003	David L. Mulcahy	$30,000	09/01/85	08/31/86	Correlations Between Chilling Injuries in Soybean Sporophyte and Pollen
Michigan State Univ. East Lansing, MI 48824	Paul K. Kindel	$137,000	08/01/85	07/31/88	Structure-activity Relationships of the Freeze-inhibitor Polysaccharides of Winter Rye and Barley
Univ. of Minnesota St. Paul, MN 55104	John V. Carter	$33,000	09/15/85	09/30/86	Role of Microtubules in Freezing Injury and Cold Acclimation in Plants

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - RESPONSE TO ENVIRONMENTAL STRESS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Minnesota St. Paul, MN 55108	Robert Brambl	$154,000	09/15/85	09/30/88	The Heat Shock (Stress) Response: Protein Function and Gene Regulation
Univ. of Nevada System on behalf of The Desert Research Institute P.O. Box 60220 Reno, NV 89506	Jeffrey Seemann	$89,000	09/01/85	08/31/87	Stress Effects on the Functioning and Efficiency of CO_2 Fixation
Cornell Univ. Ithaca, NY 14853	Peter L. Steponkus	$128,000	08/01/85	07/31/88	Cold Acclimation and Freezing Injury: Role of Plasma Membrane Lipid Alterations
Texas A&M Res. Fdn. College Station, TX 77843	John E. Mullet	$153,000	08/01/85	07/31/88	The Molecular Basis of Abscisic Acid Synthesis During Plant Water Stress
Univ. of Wisconsin Madison, WI 53706	Jiwan P. Palta	$135,000	09/01/85	08/31/87	Mechanism of Freezing Stress Resistance and Cold Acclimation in Plants

TOTAL $2,000,000

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - PLANT RESPONSE TO BIOLOGICAL STRESS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Arizona Tucson, AZ 85721	Alan J. Howarth	$50,000	09/01/85	08/31/86	Transcription and Gene Expression of a Geminivirus
Univ. of California Berkeley, CA 94720	Loy E. Volkman	$150,000	08/15/85	08/31/88	AcNPV Structural Proteins
Univ. of California Berkeley, CA 94720	T. J. Morris	$100,000	09/01/85	08/31/87	Molecular Structure and Function of the Carnation of Mottle Virus Genome
Univ. of California Davis, CA 95616	Tsune Kosuge	$66,000	07/01/85	06/30/86	Control of Virulence in Pseudomonas savastanoi
Univ. of California Davis, CA 95616	George Bruening	$45,000	09/15/85	09/30/86	Molecular Basis of Symptom Induction by Cauliflower Mosaic Virus
Univ. of California Riverside, CA 92521	William O. Dawson	$100,000	09/01/85	08/31/87	Gene Expression of cDNA Clones of Tobacco Mosaic Virus
International Society for Plant Molecular Biology Athens, GA 30602	Leon Dure, III	$2,500*	09/01/85	02/28/86	First International Congress of Plant Molecular Biology

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOTECHNOLOGY - PLANT RESPONSE TO BIOLOGICAL STRESS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Hawaii at Manoa Honolulu, HI 96822	John Leong	$130,000	09/15/85	09/30/87	Iron Uptake Genes of Plant Growth Promoting Pseudomonas
Univ. of Idaho Moscow, ID 83843	Lois K. Miller	$100,000	09/01/85	08/31/87	Improving the Efficacy of Baculovirus Pesticides by Recombinant DNA Technology
Univ. of Illinois Urbana, IL 61801	Judith H. Willis	$75,000	09/01/85	08/31/87	New Approaches for Obtaining Lepidopteran Epithelial Cell Lines
Purdue Res. Fdn. West Lafayette, IN 47907	Peter E. Dunn	$119,700	09/15/85	09/30/87	Structure and Expression of Genes Encoding Insect Antibacterial Proteins
Kansas State Univ. Manhattan, KS 66506	Steven A. Lommel	$50,000	09/15/85	09/30/86	Genetics, Replication and Pseudorecombination of the Dianthoviruses
Kansas State Univ. Manhattan, KS 66506	Jan E. Leach	$55,000	08/15/85	08/31/86	Avirulence in the Rice/Xanthomonas Campestris pv. Oryzae Interaction

COMPETITIVE RESEARCH GRANTS PROGRAM

PROGRAM AREA: BIOTECHNOLOGY - PLANT RESPONSE TO BIOLOGICAL STRESS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Agricultural Research Service, USDA Room 227, Bldg. 003 BARC-West Beltsville, MD 20705	Jacobus M. Kaper	$130,000	09/15/85	09/30/87	Cucumovirual Satellites: Structure - Biological Function
Agricultural Research Service, USDA Room 227, Bldg. 003 BARC-West Beltsville, MD 20705	Robert A. Owens	$120,000	08/15/85	08/31/88	Mechanisms of Plant Viroid Replication and Viroid-host Interaction
Agricultural Research Service ARS, USDA Room 227, Bldg. 003, BARC-West Beltsville, MD 20705	C. J. Baker	$90,000	09/01/85	08/31/87	The Molecular and Genetic Basis for Disease Resistance in Plants
Univ. of Maryland College Park, MD 20742	Alan Collmer	$100,000	09/15/85	09/30/87	Mechanism of Pectate Lyase Excretion by Erwinia chrysanthemi
North Carolina State Univ. Raleigh, NC 27695	William Dougherty	$150,000	09/01/85	08/31/87	Molecular Analysis of Potyvirus Capsid Protein; Role in Aphid Transmission

COMPETITIVE RESEARCH GRANTS PROGRAM

PROGRAM AREA: BIOTECHNOLOGY - PLANT RESPONSE TO BIOLOGICAL STRESS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Medicine & Dentistry of New Jersey-School of Osteopathic Medicine 491 Haddon Ave. Camden, NJ 08103	Ann M. Fallon	$100,000	09/01/85	08/31/87	Application of DNA-mediated Gene Transfer to Studies on Insecticide Resistance
Cornell Univ. Ithaca, NY 14853	Milton Zaitlin	$100,000	09/01/85	08/31/87	Interactions of Plant Viruses with Their Hosts
The Rockefeller Univ. New York, NY 10021	Hugh D. Robertson	$120,000	08/15/85	08/31/87	Viroid Multiplication and Disease Induction
Ohio State Univ. Res. Fdn. Columbus, OH 43212	David L. Coplin	$100,000	09/01/85	08/31/87	Genes for Exopolysaccharide Biosynthesis and Virulence in Erwinia stewartii
Oregon State Univ. Corvallis, OR 97331	Wallice I. Mills	$120,000	09/01/85	08/31/87	Isolation of Pseudomonas Gene Products that Cause Disease in Phaseolus vulgaris
Oregon State Univ. Corvallis, OR 97331	George F. Rohrmann	$100,000	09/01/85	08/31/87	Identification and Characterization of Baculovirus Gene Translation Products

COMPETITIVE RESEARCH GRANTS PROGRAM

PROGRAM AREA: BIOTECHNOLOGY - PLANT RESPONSE TO BIOLOGICAL STRESS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Oregon Eugene, OR 97403	John Poltlethwait	$150,000	09/01/85	08/31/87	Molecular Genetics of Immunity in Fruit Flies
Texas A&M Res. Fdn. College Station, TX 77843	Max D. Summers	$160,000	09/15/85	09/30/87	Integration of Campoletis sonorensis Virus DNA in Parasitoid Wasp Cellular DNA
Utah State Univ. Logan, UT 84322	Anne J. Anderson	$55,900	09/15/85	09/30/87	Molecular Events in Elicitor-Plant Cell Interaction
Utah State Univ. Logan, UT 84322	Neal K. Van Alfen	$80,900	09/15/85	09/30/88	Investigation of a Cytoplasmic Virulence Regulatory Locus in Endothia Parasitica
Virginia Polytechnic Inst. & State Univ. Blacksburg, VA 24061	George H. Lacy	$150,000	09/15/85	09/30/87	Genetic Dissection of Pathogenicity in Erwinia carotovora
Washington State Univ. Pullman, WA 99164	Clarence A. Ryan	$150,000	09/01/85	08/31/87	Isolation and Transformation of a Wound-Induced Trypsin Inhibitor Gene from Alfalfa

BIOTECHNOLOGY RESEARCH

Mr. WHITTEN. What was the CSRS fiscal year 1987 request for biotechnology research, the Department's recommendation to OMB, and the OMB allowance?

Dr. JORDAN. For fiscal year 1987, the CSRS request to the Department was $56,500,000 for biotechnology research under the Competitive Research Grants program. The Department's recommendation to OMB was $36,500,000 and OMB approved a budget estimate level of $19,880,000.

COMPETITIVE RESEARCH GRANTS

Mr. WHITTEN. Please provide for the record a list of the competitive research grants awarded in fiscal year 1985 and thus far in fiscal year 1986, describing the objective of the research, the estimated cost of each, and the institution performing the research.

Dr. JORDAN. In addition to the listing of fiscal year 1985 biotechnology grants awarded which we have already provided for the record, we will provide a listing of the remaining fiscal year 1985 Competitive Research Grants awarded, as well as any fiscal year 1986 grants awarded thus far.

[The information follows:]

COMPETITIVE RESEARCH GRANTS PROGRAM

PROGRAM AREA: BIOTECHNOLOGY - PLANT RESPONSE TO BIOLOGICAL STRESS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Washington Seattle, WA 98195	Lynn M. Riddiford	$100,000	08/15/85	08/31/87	Molecular Analysis of Eclosion Hormone in the Tobacco Hornworm, *Manduca sexta*

TOTAL $3,100,000

* Total award amount of $10,000 was split-funded with Plant Molecular Biology contributing the initial $7,500.

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: Biological Stress on Plants

GRANTS AWARDED FOR FISCAL YEAR 1986

Organization	Principal Investigator	Amount	Agreement Period	Title
Gordon Research Conferences (R.I.)	A. Cruickshank	$7,000	01/15/86-07/31/86	Gordon Research Conference on Plant-Herbivore Interactions

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL NITROGEN FIXATION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of California Berkeley, CA 94720	John B. Neilands	$50,000	09/01/85	08/31/86	Iron Assimilation in Symbiotic Nitrogen Fixing Microoganisms
Univ. of California Davis, CA 95616	Donald A. Phillips	$100,000	09/01/83	08/31/87	Host Legume Effects on Hydrogen Evolution by Rhizobium
Univ. of California Davis, CA 95616	John C. Meeks	$95,000	08/01/83	07/31/87	Regulation of Growth and Heterocyst Differentiation in Symbiotic Cyanobacteria
Univ. of California Davis, CA 95616	John L. Ingraham	$80,000	07/01/84	06/30/86	Physiological Denitrification: A Route to Conserving Fixed Nitrogen
Univ. of California Irvine, CA 92717	Barbara K. Burgess	$70,000	08/01/85	07/31/86	Substrate Reactions in Nitrogenase
Univ. of Southern California Los Angeles, CA 90089	Robert Bau	$70,000	07/01/85	06/30/87	Crystallographic Studies on the Iron-Molybdenum Co-Factor of Nitrogenase

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL NITROGEN FIXATION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of California Santa Cruz, CA 95064	Robert Ludwig	$80,000	07/01/85	06/30/87	Mechanisms of Rhizobium CRS 571 N_2 Fixation
Univ. of Connecticut Storrs, CT 06268	David R. Benson	$85,000	07/01/85	06/30/87	Symbiotic Interactions in the Frankia Symbiosis
Univ. of Hawaii at Manoa Honolulu, HI 96822	B. Ben Bohlool	$80,000	07/01/85	06/30/87	Host Control of Nodule Formation and Development in Soybean/Rhizobium N_2 Fixing Symbiosis
Univ. of Chicago Chicago, IL 60637	Robert Haselkorn	$70,000	07/01/85	06/30/86	Rearrangement of Nitrogen Fixation Genes in Cyanobacterial Heterocyst Differentiation
Univ of Chicago Chicago, IL 60637	Robert Haselkorn	$70,000	08/01/84	07/31/86	Nitrogen Fixation in Blue-green Algae (Cyanobacteria)
Agricultural Research Service, USDA 1815 N. University Street Peoria, IL 61604	James E. Harper	$33,000	09/01/85	08/31/87	Interaction of Nitrate Metabolism with Nodulation of Soybean

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL NITROGEN FIXATION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Purdue Res. Fdn. West Lafayette, IN 47907	J. T. Bolin	$105,000	08/01/83	07/31/87	Three-dimensional Structure of Nitrogenase
Univ of Massachusetts Amherst, MA 01003	Steven J. Robinson	$80,000	07/01/85	06/30/87	Transcription of a Second Copy of the Gene for Nitrogenase Reductase in Anabaena
Northeastern Univ. Boston, MA 02115	Kostia Bergman	$65,000	08/01/83	07/31/86	Motility and Chemotaxis in Rhizobium meliloti
Massachusetts Inst. of Technology Cambridge, MA 02139	W. Orme-Johnson	$75,000	06/15/84	06/30/86	Biochemical and Genetic Approaches to Structure and Function of MoFe Cofactor
Harvard College Cambridge, MA 02138	John G. Torrey	$89,734	08/01/83	07/31/87	Sporulation by Frankia Related to Nodulation and N2 Fixation

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL NITROGEN FIXATION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Michigan State Univ. East Lansing, MI 48824	Barry K. Chelm	$55,000	08/15/85	03/31/86	Developmental and Physiological Gene Regulation in the Rhizobium/Legume Symbiosis
Michigan State Univ. East Lansing, MI 48824	John L. Wang	$43,000	09/01/83	08/31/86	Lectin Receptors and Cytoskeletal Proteins in Soybean Cells
Michigan State Univ. East Lansing, MI 48824	Frank B. Dazzo	$125,000	07/01/85	06/30/87	Clover Root Hair Responses to Rhizobium trifolii and its Biologically Active Polysaccharides
Michigan Tech. Univ. Houghton, MI 49931	Wilbur H. Campbell	$45,000	08/01/85	07/31/86	Regulation of Corn Nitrate Reductase: Application of Monoclonal Antibodies
Agricultural Research Service, USDA 220 2nd Street South, 1st Floor Minneapolis, MN 54401	Carroll P. Vance	$90,000	08/01/83	06/30/87	Regulation of Plant-Bacterial Interactions During Legume Root Nodule Formation
Univ. of Minnesota St. Paul, MN 55104	Edmund P. Day	$85,000	08/01/83	07/31/87	Magnetic Susceptibility Studies of Nitrogenase

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL NITROGEN FIXATION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Missouri Columbia, MO 65211	David W. Emerich	$110,000	09/01/85	08/31/87	Symbiotic Nitrogen Fixation: The Role of Organic Acids
Univ. of Missouri Columbia, MO 65211	Dale G. Blevins	$130,000	08/01/85	07/31/87	Ureide Metabolism in Nodulated Soybeans
Univ. of Missouri Columbia, MO 65211	Judy D. Wall	$45,000	09/15/84	09/30/86	Nitrogen Metabolism and Nitrogen Fixation of Rhodopseudomonas capsulata
Washington Univ. St. Louis, MO 63130	Daniel H. Kohl	$100,000	08/01/85	07/31/87	Natural Abundance of ^{15}N to Indicate Pathways of Fixed N in Nodules
Univ. of Nebraska Lincoln, NE 68588	T. Adrian George	$85,000	07/01/85	06/30/87	Dinitrogen Complexes of Iron and Molybdenum with Sulfur Ligands
Boyce Thompson Inst. for Plant Res. Tower Road Ithaca, NY 14853	Thomas A. LaRue	$19,000	08/01/83	07/31/86	Host Plant Genetics and Nodule Formation

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL NITROGEN FIXATION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Battelle Memorial Institute 505 King Avenue Columbus, OH 43201	G. A. Peters	$70,000	09/15/84	09/30/86	The Azolla Anabaena Symbioses: Form and Function
Battelle Memorial Institute 505 King Avenue Columbus, OH 43201	T. V. Bhuvaneswari	$75,000	08/01/83	08/31/87	Analysis of the Natural Population of R. japonicum as Competitors and Symbionts
Battelle Memorial Institute 505 King Avenue Columbus, OH 43201	John W. McDonald	$90,000	09/01/85	08/31/87	Chemical and Spectroscopic Probes of the Metal Sites of Nitrogenase
Oregon State Univ. Corvallis, OR 97331	Lyle R. Brown	$45,000	09/01/83	08/31/86	Molecular Mechanisms Controlling Nif and Sym Genes: A Role for RNA Polymerase
Oregon State Univ. Corvallis, OR 97331	Peter J. Bottomley	$60,000	08/01/85	07/31/88	Factors Influencing Competition between Members of Indigenous Populations of R. trifolii
Univ. of Tennessee Knoxville, TN 37966	Beth C. Mullin	$30,266	08/01/85	07/31/86	Organization and Expression of Leghemoglobin-like Sequences in Alnus Glutinosa

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL NITROGEN FIXATION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Texas at Austin Austin, TX 78712	Fred R. Tabita	$110,000	08/01/83	07/31/87	Recovery of Nitrogenase from Oxygen Inactivation
Virginia Polytechnic Inst. & State Univ. Blacksburg, VA 24061	Dennis R. Dean	$90,000	09/01/85	08/31/87	Organization and Expression of Structural Genes for Nitrogenase from Agotobacter Vinelandii
Univ. of Wisconsin Madison, WI 53706	Paul W. Ludden	$105,000	09/01/85	08/31/87	Non-genetic Regulation of Nitrogenase in Photosynthetic Bacteria
Univ. of Wisconsin Madison, WI 53706	Eldon H. Newcomb	$95,000	07/01/85	06/30/87	Structure and Function in Bean Root Nodules Induced by Mutant Rhizobia
Marquette Univ. Milwaukee, WI 53233	Kenneth D. Noel	$80,000	07/01/85	06/30/87	Rhizobium Genes for Root Nodule Development

TOTAL $3,060,000

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL STRESS ON PLANTS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Arkansas Fayetteville, AR 72701	Rose Gergerich	$119,000	07/01/85	06/30/87	Ribonuclease in Beetle Regurgitant as a Determinant in Plant Virus Transmission
Univ. of Arkansas Fayetteville, AR 72701	Seth Y. Young	$70,000	09/15/83	09/30/87	Baculovirus Transmission in Anticarsia gemmatalis Populations on Soybean
Northern Arizona Univ. Flagstaff, AZ 86011	Thomas Whitham	$40,000	07/15/84	07/31/86	The Interaction of Environmental Stress and Herbivory on Pinyon Pine, Pinus edulis
Univ. of Arizona Tucson, AZ 85721	Michael McClure	$50,000	07/01/84	06/30/86	Isolation and Characterization of Stylet Exudates from Root-Knot Nematodes
Univ. of California Davis, CA 95616	John M. Duniway	$50,000	07/01/85	06/30/86	Influence of Environmental Stresses on the Development and Impact of Phytophthora Root Rot
Univ. of California Davis, CA 95616	William Timberlake	$50,000	09/01/84	08/31/86	Development of Molecular Cloning Vectors for Filamentous Fungi

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL STRESS ON PLANTS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of California Davis, CA 95616	Sean S. Duffey	$50,000	06/01/84	07/31/86	Biochemical Facets of Antibiosis of Tomatoes Against Noctuid Larvae
Univ. of California Davis, CA 95616	George Bruening	$50,000	09/15/84	09/30/86	Antiviral Action of Satellite RNA
Univ. of California Riverside, CA 92521	Edward Platzer	$50,000	09/01/85	08/31/88	Molecular Diagnostics of Plant Parasitic Nematodes
The Salk Inst. for Biological Studies P.O. Box 85800 San Diego, CA 92138	Christopher Lamb	$50,000	09/15/84	09/30/86	Molecular Biology of the Phytoalexin Defense Response
Univ. of California Santa Cruz, CA 95064	L. R. Fox	$90,000	06/01/85	05/31/87	Fertilizer-Community Interactions Affecting Brassica Productivity
Univ. of Delaware Newark, DE 19711	Thomas K. Wood	$90,000	06/01/85	07/31/87	Insect Phenology Mediated by Host Plant Water Relations

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL STRESS ON PLANTS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Florida Gainesville, FL 32611	Michael J. Davis	$70,000	07/01/85	06/30/87	Host-Pathogen Interactions in Ratoon Stunting Disease of Sugarcane
Univ. of Florida Gainesville, FL 32611	Simon S. J. Yu	$70,000	07/15/85	07/31/87	Detoxication of Allelochemicals by Herbivorous Insects
Agricultural Research Service, USDA P.O. Box 70, HR #2 Ames, IA 50010	Karl J. Kramer	$90,000	09/15/85	09/30/88	Insect Control by Manipulation of Cuticle Destabilizing Enzymes
Iowa State Univ. of Science & Technology Ames, IA 50011	Larry P. Pedigo	$50,000	06/01/83	05/31/87	Plant and Strand Response to Early Season Insect-Induced Stresses
Loyola Univ. of Chicago Chicago, IL 60611	S. K. Farrand	$50,000	09/01/84	08/31/86	Crown Gall Control: Plasmid Engineering to Maximize Control and Minimize Failures
Univ. of Illinois Urbana, IL 61801	Gilbert Waldbauer	$90,000	06/01/83	08/31/87	Corn Earworm: Self Selection of Nutrient Balance on Natural and Defined Diets

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL STRESS ON PLANTS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Purdue Res. Fdn. West Lafayette, IN 47907	Avtar K. Handa	$85,000	07/01/85	06/30/87	Molecular Cloning of Pathogenicity Genes of Erwinia carotovora
Purdue Res. Fdn. West Lafayette, IN 47907	David N. Kuhn	$45,000	07/01/83	12/31/86	Genes for Gene Theory and the Role of Recognition in Soybean Disease Resistance
Purdue Res. Fdn. West Lafayette, IN 47907	Larry L. Murdock	$100,000	09/01/85	08/31/87	Central Nervous Control of Insect Feeding Behavior
Univ. of Kentucky Lexington, KY 40546	M. R. Siegel	$75,000	06/01/85	05/31/87	Endophytic Fungi: Harmful and Beneficial Effects on Forage and Turf Grasses
Univ. of Kentucky Lexington, KY 40506	David A. Smith	$35,000	09/15/83	09/30/87	Phytoalexin Detoxification as a Determining Characteristic of Fungal Virulence
Univ. of Kentucky Res. Fdn. Lexington, KY 40506	John G. Shaw	$45,000	07/01/85	06/30/86	Viral Gene Expression in Potyvirus Infections

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL STRESS ON PLANTS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Kentucky Res. Fdn. Lexington, KY 40536	R. E. Rhoads	$85,000	07/01/85	06/30/87	Characterization of dsRNA in Hypovirulent Strains of Endothia parasitica
Univ. of Kentucky Res. Fdn. Lexington, KY 40506	Juan G. Rodriguez	$80,000	08/01/83	07/31/87	Quantification of Plant Stress and Soybeans by Spider Mites
Univ. of Kentucky Res. Fdn. Lexington, KY 40506	T. P. Pirone	$50,000	05/15/83	05/31/86	Nature and Mode of Action of the Potyvirus Helper Component
Louisiana State Univ. & AgM College Baton Rouge, LA 70803	Ding S. Shih	$85,000	08/01/85	07/31/87	Plant Viral Protein Processing Enzymes and Specific Inhibitors
Univ. of Massachusetts Amherst, MA 01003	Ronald Prokopy	$91,000	09/15/85	09/30/87	Host-finding Dynamics of Apple Maggot Flies
Harvard College Cambridge, MA 02138	Arthur Ayers	$80,000	07/01/85	06/30/87	Plant Recognition of Pathogen Components (Elicitor)

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL STRESS ON PLANTS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Maine at Orono Orono, ME 04469	Stellos Tavantzis	$50,000	07/01/84	06/30/86	Biological Control by Transmissible Hypovirulence in Rhizoctonia solani
Michigan State Univ. East Lansing, MI 48824	James Miller	$50,000	06/01/83	05/31/86	Quantifying Sensory Determinants Mediating Oviposition by the Onion Fly
Michigan State Univ. East Lansing, MI 48824	R. Hammerschmidt	$80,000	06/01/85	05/31/87	Regulation and Localization of Induced Resistance in Cucumis
Agricultural Research Service, USDA 220 2nd Street South, 1st Floor Minneapolis, MN 55401	Alan P. Roelfs	$45,000	07/01/85	06/30/86	Genetic Diversity in Sexual and Asexual Populations of Rust Fungi in Agroecosystems
Agricultural Research Service, USDA 220 2nd Street South, 1st Floor Minneapolis, MN 55401	William Bushnell	$80,000	09/15/85	09/30/87	Locating Race-specific Incompatibility Events in Powdery Mildew of Barley
Washington Univ. St. Louis, MO 63130	Joseph Varner	$65,000	07/01/83	06/30/87	The Role of Hydroxyproline-rich Glycoproteins in Plant Response to Stress

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL STRESS ON PLANTS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
North Carolina State Univ. Raleigh, NC 27695	Richard Roe	$80,000	09/01/85	08/31/87	Regulation of Juvenile Hormone Esterase -- New Biodegradable Insecticides
North Carolina State Univ. Raleigh, NC 27695	George Kennedy	$50,000	07/01/85	06/30/88	Mechanisms of Multiple Insect Resistance in Wild Tomato Species
North Carolina State Univ. Raleigh, NC 27695	Jeng-sheng Huang	$90,000	07/01/85	06/30/87	Iron Metabolism in Relation to Nematode-suppressed Nodule Development in Soybean
Agric. Expt. Station Univ. of Nebraska Lincoln, NE 68583	J. M. Daly	$50,000	07/01/85	06/30/88	Identification of Host Resistance or Susceptibility to Toxins
Univ. of Nevada Reno, NV 89557	Gary Blomquist	$50,000	07/01/85	06/30/88	Biosynthesis of Insect Hydrocarbons - Potential for Insect Control
Boyce Thompson Inst. for Plant Research Tower Road Ithaca, NY 14853	V. Macko	$77,982	09/01/85	08/31/87	Characterization of Receptor Sites of Host-Selective Toxins from Helminthosporium victoriae

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL STRESS ON PLANTS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Boyce Thompson Inst. for Plant Research Tower Road Ithaca, NY 14853	Patrick Hughes	$40,000	09/01/84	08/31/86	Quantitation of Viral Pesticide Infectivity and Pathogenicity
Cornell Univ. Ithaca, NY 14853	James R. Aist	$70,000	09/01/85	08/31/87	Calcium Regulation in Secretion and Disease Resistance
Cornell Univ. Ithaca, NY 14853	O. C. Yoder	$70,000	09/15/84	09/30/87	Utility of Cochliobolus of Plasmids for Vector Construction
Ohio State Univ. Res. Fdn. Columbus, OH 43212	Lawrence Madden	$75,000	09/01/85	03/31/87	Rain Splash Dispersal of Phytophthora cactorum
Ohio State Univ. Columbus, OH 43212	Lowell Nault	$50,000	06/15/84	06/30/86	Evolution of Leafhoppers and Stunting Pathogens with Maize and its Ancestors
Oklahoma State Univ. Stillwater, OK 74078	Richard Johnson	$90,000	06/01/83	05/31/87	Wheat Adaptations for Greenbug Resistance under Drought

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL STRESS ON PLANTS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Oregon State Univ. Corvallis, OR 97331	Steven Radosevich	$65,800	09/15/85	08/31/87	Competition between Douglas-fir and Red Alder Seedlings: Resource Use, Physiology and Growth Analysis
Texas A&M Res. Fdn. College Station, TX 77843	H. Williams	$100,000	08/01/85	07/31/87	Influence of Variable Plant Chemistry on Parasitoid Attraction and Learning
Utah State Univ. Logan, UT 84322	Neal Van Alfen	$75,000	07/01/85	06/30/87	The Role of Bacterial EPS as a Virulence Factor in a Wilt Disease
Utah State Univ. Logan, UT 84322	Edith B. Allen	$90,000	06/01/83	05/31/87	Interactions of VA Mycorrhizae and Weeds: Mechanisms for Reduced Stress on Rangeland Grasses
Agric. Expt. Station Utah State Univ. Logan, UT 84322	Anne J. Anderson	$50,000	09/15/84	09/30/86	The Role of the Plant in Biological Control of Fungal Pathogens
Univ. of Virginia Charlottesville, VA 22903	James Riopel	$32,762	08/15/84	08/31/86	Host/Parasite Interactions in Parasitic Angiosperms

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: BIOLOGICAL STRESS ON PLANTS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Washington Seattle, WA 98195	Eugene Nester	$50,000	08/01/84	07/31/86	Organization and Regulation of Vir Genes of Agrobacterium
Univ. of Wisconsin Madison, WI 53706	Arthur Kelman	$95,000	08/01/83	07/31/87	Resistance of Potato Tubers to Tissue Maceration by Pectolytic Enzymes
Univ. of Wisconsin Madison, WI 53706	Douglas Rouse	$95,000	07/15/85	07/31/87	Spatial Patterns of Brown Spot of Snap Beans and of Pseudomonas syringae
Univ. of Wisconsin Madison, WI 53706	Nelson E. Balke	$90,000	07/01/85	06/30/88	Glucosylation as a Mechanism for Detoxication of Allelopathic Chemicals by Plants
Univ. of Wisconsin Madison, WI 53706	M. T. Stephen Hsia	$100,000	07/01/85	06/30/87	Phytochemical and Toxicological Aspects of Foodplant Specialization in Lepidoptera
Univ. of Wisconsin Milwaukee, WI 53201	Kenneth Nealson	$90,000	09/01/85	08/31/87	Physiological Studies of Insect Pathogenic Bacteria in the Genus Xenohabdus

TOTAL $4,181,544

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: GENETIC MECHANISMS FOR CROP IMPROVEMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of California Davis, CA 95616	Richard Michelmore	$174,000	07/01/85	06/30/88	Variation in Lettuce Downy Mildew
Univ. of California Davis, CA 95616	Calvin Qualset	$85,250	06/01/85	05/31/87	Transfer of a Gene for Barley Yellow Dwarf Virus Resistance from Barley to Wheat
Univ. of California, San Diego La Jolla, CA 92093	Stephen Howell	$150,000	06/15/85	05/31/87	Complementation of Modified CaMV Genomes
Univ. of California Los Angeles, CA 90024	C. Fred Fox	$5,000	04/01/85	06/30/85	Research Conference on Plant Genetics
Univ. of California Los Angeles, CA 90024	George G. Laties	$83,000	09/15/83	09/30/87	Ethylene and Wounding Directed Gene Expression in Plant Tissues
Zoecon Corporation 975 California Avenue Palo Alto, CA 94304	Donald Weeks	$10,000	07/01/85	12/31/85	Research Conference on the Genetics and Molecular Biology of Chlamydomonas

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: GENETIC MECHANISMS FOR CROP IMPROVEMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of California Riverside, CA 92521	Eugene Nothnagel	$94,000	07/01/85	06/30/87	Plasma Membrane-Cytoskeleton Interactions in Fused Plant Protoplasts
Yale Univ. New Haven, CT 06520	Ian M. Sussex	$171,000	05/15/85	05/31/87	Stage-specific Gene Expression in the Shoot Apex in Relation to Flowering
Carnegie Institution of Washington 1530 P. Street, N.W. Washington, D.C. 20005	William Thompson	$82,000	09/15/85	09/30/86	Isolation and Characterization of Genes Regulated by Light
Univ. of Florida Gainesville, FL 32611	R. L. Smith	$76,000	07/01/85	06/30/87	Organelle DNA Organization and Cytoplasmic Male Sterility in Pennisetum
Univ. of Florida Gainesville, FL 32611	Prem S. Chourey	$90,500	07/01/85	06/30/87	Molecular Analysis of Genomic Variability in Tissue Cultured Cells of Maize and Sorghum
Florida State Univ. Tallahassee, FL 32306	George W. Bates	$101,400	07/15/83	07/31/87	Interspecific Gene Transfer by Fusin of Irradiated Plant Protoplasts

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: GENETIC MECHANISMS FOR CROP IMPROVEMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Agricultural Research Service, USDA P.O. Box 5677 Athens, GA 30613	Charles Stuber	$58,000	09/15/83	09/30/86	Isozyme Loci as Markers for Locating and Manipulating Quantitative Trait Loci
Univ. of Georgia Res. Fdn. Athens, GA 30602	Wayne W. Hanna	$145,000	09/15/85	09/30/88	Interspecific Transfer of Genes for Obligate Apomixis from Wild *Pennisetum* to Pearl Millet
Univ. of Illinois Urbana, IL 61801	Theodore Hymowitz	$140,000	08/15/85	08/31/88	The genus *Glycine* subgenus *Glycine*: Broadening the Genetic Base of Soybeans
Agricultural Research Services, USDA P.O. Box 70, HR #2 Ames, IA 50011	Arnel R. Hallauer	$99,100	06/01/85	05/31/90	Selection Methods for Germplasm Enhancement in Corn
Kansas State Univ. Manhattan, KS 66506	Bikram Gill	$81,000	07/01/85	06/30/87	Genome Evolution in Polyploid Species: Cytogenetic Analysis of Wheat-*Elymus* Addition Lines
Kansas State Univ. Manhattan, KS 66506	Rollin G. Sears	$17,000	07/15/84	07/31/86	Chromosomal Mapping of Genes Controlling Tissue Culture Response in Wheat

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: GENETIC MECHANISMS FOR CROP IMPROVEMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Kansas State Univ. Manhattan, KS 66506	Lowell Johnson	$64,000	09/15/85	09/30/87	Transfer of Genetic Information into Alfalfa through Protoplast Fusion
Univ. of Kentucky Res. Fdn. Lexington, KY 40506	Glenn Collins	$78,500	07/01/85	06/30/87	Wide Hybridization and Gene Transfer in Trifolium
Univ. of Kentucky Res. Fdn. Lexington, KY 40546	N. L. Taylor	$56,000	09/01/83	08/31/86	Genetics and Breeding of Somaclonal Variation in Red Clover
Univ. of Maine Orono, ME 04469	Robert Roxby	$61,000	07/01/85	06/30/88	Isolation and Characterization of Potato Tuberization Genes
Agricultural Research Service, USDA Room 227, Bldg. 003, BARC-West Beltsville, MD 20705	Benjamin Matthews	$55,000	09/15/85	09/30/87	Cloning and Expression of Genes Involved in Amino Acid Biosynthesis
Univ. of Maryland Baltimore County 5401 Wilkens Avenue Catonsville, MD 21228	Madeline C. Wu	$37,000	09/01/85	08/31/86	The Replication of Chloroplast DNA in Chlamydomonas reinhardii

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: GENETIC MECHANISMS FOR CROP IMPROVEMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Harvard College Cambridge, MA 02138	James Birchler	$168,400	07/01/85	06/30/88	Chromosomal Manipulation in Maize
Michigan State Univ. East Lansing, MI 48824	C. Peter Wolk	$80,000	07/01/85	06/30/87	Further Mapping of the Chromosome of Anabaena by a Surrogate Genetic Approach
Agricultural Research Service, USDA 220 2nd Street South, 1st Floor Minneapolis, MN 55401	Leonard Joppa	$36,000	09/15/85	09/30/87	The Effectiveness of Homoeologous Pairing Genes in Triticum turgidum, T. aestivum, and T. speltoides
Univ. of Minnesota St. Paul, MN 55104	R. L. Phillips	$76,000	08/01/85	07/31/87	Tissue Culture Genetic Systems
Washington Univ. St. Louis, MO 63130	John C. Rogers	$178,000	08/01/85	07/31/88	Regulation of Gene Expression in Barley Aleurone Cells
Univ. of Nebraska Lincoln, NE 68588	Russel H. Meints	$92,000	08/01/85	07/31/87	Development of Transformation Vectors in Chlorella -like Green Alga

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COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: GENETIC MECHANISMS FOR CROP IMPROVEMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Res. Fdn. of State Univ. of New York Albany, NY 12201	Jeremy A. Bruenn	$50,000	09/01/85	08/31/87	Cloning and Expression of the Ustilago maydis Virus Toxin Gene
Cornell Univ. Ithaca, NY 14853	J. B. Nasrallah	$148,000	09/15/85	09/30/87	Molecular Genetic Analysis of the Brassica S Locus
Cornell Univ. 123 Day Hall Ithaca, NY 14853	Martha Mutschler	$136,000	09/01/85	08/31/87	Genetic Modification of Cytoplasmic Traits in Brassica Species
Cornell Univ. Ithaca, NY 14853	Steven Tanksley	$65,000	09/01/85	08/31/87	Further Development of Protein-specific Genetic Markers in Tomato
North Carolina State Univ. Raleigh, NC 27650	Harold Stalker	$30,000	09/01/83	08/31/86	Biosystematics and Utilization of Arachis Species to Improve Cultivated Peanuts
Ohio State Univ. Res. Fdn. Columbus, OH 43212	George Marzluf	$70,000	06/01/85	05/31/87	Genetic Transformation and Direct Cloning in Neurospora

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: GENETIC MECHANISMS FOR CROP IMPROVEMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Pennsylvania State Univ. University Park, PA 16802	Charles D. Boyer	$40,000	09/01/85	03/31/87	Mutant Expression in Maize Endosperm Suspension Cultures
Univ. of Rhode Island Kingston, RI 02881	John Mottinger	$120,000	08/01/83	07/31/87	Studies on Mutations Associated with Virus Infection in Maize
Texas A&M Res. Fdn. College Station, TX 77843	William D. Park	$78,000	09/15/83	09/30/86	Regulation of Tuber Protein Synthesis in Potato
Texas A&M Res. Fdn. College Station, TX 77843	Hugh D. Wilson	$56,000	09/15/83	09/30/86	Genetic Structure of Weed-Crop Population Systems (Cucurbita and Chenopodium)
Virginia Polytech Inst. & State Univ. Blacksburg, VA 24061	Richard Veilleux	$80,850	09/01/85	08/31/87	Use of Monoploid Genotypes in Cell Cultures and Breeding Strategies for Potato
Washington State Univ. Pullman, WA 99164	Michael Thomashow	$50,000	08/01/83	07/31/86	Characterization of Nicotiana-pTiAg63 Related DNA Sequences

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: GENETIC MECHANISMS FOR CROP IMPROVEMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Wisconsin Madison, WI 53706	Peter H. Quail	$125,000	09/01/85	08/31/86	The Phytochrome Gene: Structure, Organization and Expression
Univ. of Wisconsin Madison, WI 53706	Richard Vierstra	$169,000	07/01/85	06/30/88	Biochemical and Molecular Characterization of Plant Ubiquitin

TOTAL $3,860,000

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: PHOTOSYNTHESIS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of California Berkeley, CA 94720	Anastasios Melis	$80,000	09/01/85	08/31/87	Structural Differentiation and Functional Organization in Higher Plant Chloroplasts
Univ. of California Davis, CA 95616	Mark Matthews	$75,000	09/01/85	08/31/87	Physiological Mechanisms of Photosynthetic Acclimation to Water Deficits
Univ. of California Davis, CA 95616	Robert Pearcy	$70,000	07/01/85	06/30/87	Dynamic Responses of Photosynthesis to Variable Light
San Francisco Operations Office U. S. Department of Energy Oakland, CA 94612	Kenneth Sauer	$120,000	09/01/85	08/31/87	Electron Spin Echo Spectroscopy in Photosynthesis
Univ. of Denver (Colorado Seminary) University Park Denver, CO 80208	Steven Berg	$70,000	06/01/85	05/31/87	The Use of Polyclonal Antibodies to Study the Topology of Three Thylakoid Protein Complexes

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: PHOTOSYNTHESIS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Agricultural Research Service, USDA 2625 Redwing Road Ft. Collins, CO 80526	Roger Wyse	$45,000	09/01/84	03/31/86	Control Mechanisms for Photosynthate Partitioning in Sugarbeet
Univ. of Miami Coral Gables, FL 33124	Roger E. Fenna	$25,678	09/01/85	08/31/86	Structural Studies of Chlorophyll-Protein Complexes
Agricultural Research Service, USDA P.O. Box 5677 Athens, GA 30613	Steven Huber	$80,000	06/01/85	05/31/87	Mechanisms for Control of Photosynthetic Sucrose Formation
Iowa State Univ. of Science & Technology Ames, IA 50011	Martin Spalding	$75,000	08/15/85	08/31/87	Chlamydomonas Mutants Defective in the CO_2-concentrating Pathway
Univ. of Chicago Chicago, IL 60637	Robert Haselkorn	$111,972	07/01/85	06/30/87	Molecular Genetic Analysis of the Photosynthetic Apparatus in Cyanobacteria
Univ. of Chicago Chicago, IL 60637	Gayle Lamppa	$75,000	07/01/85	06/30/87	Molecular Basis of the Selective Transport of Proteins into Chloroplasts

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: PHOTOSYNTHESIS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Health Sciences The Chicago Medical School 3333 Green Bay Rd. North Chicago, IL 60064	Frank Marcus	$115,000	09/01/83	08/31/87	Light Regulated Enzymes of Photosynthetic Carbon Assimilation
Kansas State Univ. Manhattan, KS 66506	James Guikema	$28,925	09/15/83	09/30/86	Development of Lipid-Protein Complexes in Anacystis Membranes
Kansas State Univ. Manhattan, KS 66506	James Guikema	$33,925	09/15/83	09/30/87	Development of Lipid-Protein Complexes in Anacystis Membranes
Harvard College Cambridge, MA 02138	Lawrence Bogorad	$60,000	09/01/85	08/31/86	Genes for Photosynthesis in Corn
Univ. of Michigan Ann Arbor, MI 48109	R. R. Scharp	$90,000	09/01/83	08/31/87	Amino Acids at the Active Site of CF_1, a Spin-echo nmr Study
Michigan State Univ. East Lansing, MI 48824	C. Somerville	$64,500	07/15/83	07/31/86	Directed Genetic Modification of RuBP Carboxylase/Oxygenase

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: PHOTOSYNTHESIS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Washington Univ. St. Louis, MO 63130	Dewey Holten	$100,000	09/01/85	08/31/87	Ultrafast Spectroscopic Studies of Photosynthetic Electron Transfer
Agric. Expt. Station Univ. of Nebraska Lincoln, NE 68583	Raymond Chollet	$90,000	09/01/85	08/31/87	Regulation of Pyruvate, Pi Dikinase Activity
Agric. Expt. Station Univ. of Nebraska Lincoln, NE 68588	Robert Spreitzer	$75,000	06/15/85	05/31/87	Genetic Modification of RuBP Carboxylase/Oxygenase in Chlamydomonas reinhardii
Rutgers, The State Univ. New Brunswick, NJ 08903	Barbara Zilinskas	$85,000	06/01/85	05/31/87	Structure and Function of Cyanobacterial Photosynthetic Systems
Rutgers, The State Univ. New Brunswick, NJ 08903	Carl A. Price	$75,000	07/01/85	06/30/87	Translational Regulation in Chloroplasts
Cornell Univ. Ithaca, NY 14853	Richard McCarty	$110,000	09/01/83	08/31/87	The Glycolate Transporter of the Chloroplast Envelope

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: PHOTOSYNTHESIS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Cornell Univ. Ithaca, NY 14853	Andre Jagendorf	$55,000	09/15/85	09/30/86	Chloroplast Proteins: Synthesis, Degradation and Controls
The Rockefeller Univ. New York, NY 10021	Anthony Cashmore	$120,000	08/01/83	07/31/87	Characterization of Plant Genes Encoding Photosynthetic Membrane Proteins
Rensselaer Polytechnic Inst. Troy, NY 12180	John Salerno	$80,000	07/01/85	06/30/87	Electron Transfer and Energy Conservation in Chloroplasts
Brookhaven National Laboratory U.S. Department of Energy Upton, NY 11973	John Bennett	$90,000	09/01/85	08/31/87	Biosynthesis, Structure and Assembly of the Reaction Center of Photosystem 2
Brookhaven National Laboratory U. S. Department of Energy Upton, NY 11973	G. Hind	$80,000	09/01/85	08/31/87	Photosynthetic Mechanisms in Nitrogen-fixing Heterocysts of Cyanobacteria

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: PHOTOSYNTHESIS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Brookhaven National Laboratory U.S. Department of Energy Upton, NY 11973	John Bennett	$55,000	09/01/84	08/31/86	Chloroplast Protein Kinases and the Regulation of Photosynthesis
Pennsylvania State Univ. University Park, PA 16802	S. Stevens, Jr.	$60,000	09/01/85	12/31/86	Directed Mutagenesis of the Ribulose Bisphosphate Carboxylase Small Subunit
Pennsylvania State Univ. University Park, PA 16802	J. Shannon	$90,000	09/01/85	08/31/87	Mechanism(s) of Assimilate Absorption into the Endosperm of Zea mays L. Kernels
Gordon Research Conferences c/o Univ. of Rhode Island Gordon Research Ctr. Kingston, RI 02881	Gerald Babcock	$5,000	07/01/85	03/31/86	Gordon Research Conference on Physicochemical Aspects of Photosynthesis
Brown Univ. Providence, RI 02912	John Biggins	$90,000	09/01/85	08/31/87	Regulation of Excitation Energy Distribution in the Phycobilin - Chlorophyll Systems

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: PHOTOSYNTHESIS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Brown Univ. Providence, RI 02912	John Biggins	$10,000	09/01/85	08/31/87	Partial Support of the VII International Congress on Photosynthesis
Univ. of South Carolina Columbia, SC 29208	Anthony Huang	$90,000	08/01/83	07/31/87	Metabolic Control in Peroxisomes and Mitochondria in Photorespiration
Univ. of Texas at Austin Austin, TX 78712	F. Robert Tabita	$110,000	09/01/83	08/31/87	Bacterial Genes Coding for Plant Ribulose Bisphosphate Carboxylase/Oxygenase
Texas Tech Univ. Lubbock, TX 79409	David Knaff	$60,000	09/01/85	08/31/86	Protein Complexes in Photosynthetic Electron Transfer Reactions
Texas Tech Univ. Lubbock, TX 79409	Allan S. Holaday	$75,000	06/01/85	05/31/87	Controls on the Development of C_4 Photosynthesis in C_3 x C_4 *Flaveria* F_1 Hybrids
Univ. of Wisconsin Madison, WI 53706	Marion O'Leary	$115,000	09/01/83	08/31/87	Mechanism of Action of Phosphoenolpyruvate Carboxylase

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: PHOTOSYNTHESIS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Wisconsin Madison, WI 53706	John Markley	$120,000	09/01/85	08/31/87	Mechanisms of Electron Transport in Photosynthesis

TOTAL $3,060,000

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: HUMAN NUTRITION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Arizona Tucson, AZ 85721	Roger A. Sunde	$50,000	07/01/85	06/30/86	Selenomethionine Metabolism and Utilization
Agricultural Research Service, USDA 800 Buchanan Street Albany, CA 94710	Judith R. Turnlund	$70,000	09/15/85	09/30/86	Use of Stable Isotopes to Determine Dietary Requirements of Zn, Cu, Fe, Ca, and Mg
Univ. of California Berkeley, CA 94720	Janet C. King	$40,000	08/01/85	07/31/86	Dietary Induced Thermogenesis in the Obese Pregnant Woman
Univ. of California Davis, CA 95616	Bo Lonnerdal	$60,000	09/01/85	08/31/86	Manganese Absorption in Humans
Univ. of California Los Angeles, CA 90024	Isabelle F. Hunt	$75,000	09/01/83	08/31/86	Diet and Bone Mineral Density in Women Aged 50-79 Years
Colorado State Univ. Ft. Collins, CO 80523	Gustav R. Jansen	$70,000	09/01/85	08/31/86	Mechanisms by which Dietary Protein and Amino Acids Control Lactation

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: HUMAN NUTRITION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Georgetown Univ. Washington, D.C. 20057	Margit Hamosh	$36,000	09/15/85	09/30/86	Milk Lipases in Delivery and Digestion of Fat in Infants: An Animal Model
George Washington Univ. Washington, D.C. 20052	George V. Vahouny	$100,000	08/01/85	07/31/87	Dietary Fibers and Intestinal Function: Structure-Function Correlations
Fort Wayne State Hospital & Training Center Ft. Wayne, IN 46815	Stephen P. Coburn	$100,000	09/15/85	09/30/88	Quantitative Assessment of Vitamin B_6 Metabolism in Man with Stable Isotopes
Purdue Res. Fdn. West Lafayette, IN 47907	Robert DiSilvestro	$55,600	09/01/85	08/31/87	Evaluation of Current and Newly Proposed Methods of Copper Status Assessment
Purdue Res. Fdn. West Lafayette, IN 47907	S. Suzanne Nielsen	$110,000	09/15/85	09/30/87	Resistance of Legume Proteins to Proteolysis
Purdue Res. Fdn. West Lafayette, IN 47907	Jon A. Story	$70,000	09/01/83	08/31/86	Mechanisms of Alteration of Bile Acid Excretion by Dietary Fiber

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: HUMAN NUTRITION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Boston Univ. Boston, MA 02215	Steven H. Zeisel	$50,000	09/01/85	08/31/87	Is Choline an Essential Nutrient for Humans?
Massachusetts General Hospital Boston, MA 02114	Susan S. Baker	$45,000	08/01/85	07/31/86	Effect of Malnutrition on Barrier Function of Gastrointestinal Microvillus Membrane
Massachusetts Inst. of Technology Cambridge, MA 02139	Vernon R. Young	$100,000	09/15/84	01/30/86	A Novel Approach for Study of Human Amino Acid Metabolism and Dietary Requirements
Massachusetts Inst. of Technology Cambridge, MA 02139	George Wolf	$90,000	09/01/85	01/31/87	Biochemical Reasons for the Requirement of Vitamin A in the Mammalian Organism
Johns Hopkins Univ. Baltimore, MD 21218	Tomas R. Guilarte	$36,000	09/01/85	08/31/86	Maternal Vitamin B-6 Nutrition: Effects on the Dopaminergic System of Progeny
Univ. of Missouri Columbia, MO 65211	Calvin W. Woodruf	$65,000	09/15/84	08/31/86	Vitamin A Requirements of Preterm Infants

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: HUMAN NUTRITION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Cornell Univ. Ithaca, NY 14853	Steven D. Mercurio	$55,000	09/01/85	08/31/87	Influences of Dietary Mercaptans on the Biological Function of Selenium
Cornell Univ. Ithaca, NY 14853	John E. Kinsella	$80,000	07/15/82	09/30/86	Antithrombotic Action of n3 Polyunsaturated Acids: Optimum Intake and Effects on Prostaglandins
St. Luke's-Roosevelt Inst. for Health Science 114th St. & Amsterdam Ave. New York, NY 10025	F. X. Pi-Sunyer	$60,000	07/01/85	06/30/86	Chromium Absorption and Assessment
Duke Univ. Durham, NC 27706	Jean L. Johnson	$68,000	07/01/85	06/30/86	Role of Molybdenum and the Molybdenum Cofactor in Human Health and Nutrition
Oklahoma State Univ. Stillwater, OK 74078	Eldon C. Nelson	$90,000	08/15/85	08/31/87	Metabolism of Retinoids
Univ of Texas at Austin Austin, TX 78712	J. Freeland-Graves	$35,000	07/15/84	07/31/86	Manganese: Assessment of Requirements and Functions

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: HUMAN NUTRITION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Vermont & State Agric. College Burlington, VT 05405	Elliot Danforth	$80,000	08/01/83	07/31/86	Diet-induced Alterations in Thyroid Hormone Metabolism and Nutritional Requirements
Virginia Polytechnic Inst. & State Univ. Blacksburg, VA 24061	Mark L. Failla	$60,000	09/01/85	08/31/86	Influence of Obesity on Zinc and Iron Metabolism
Virginia Commonwealth Univ. Richmond, VA 23298	Gregory S. Head	$70,000	09/01/85	08/31/87	Bioavailability and Requirements of Biotin for infants and Children
Univ. of Wisconsin Madison, WI 53706	Frank R. Greer	$100,000	09/01/85	08/31/87	The Vitamin D Requirements of Breast-fed Infants in the United States

TOTAL $1,920,600

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: ACID PRECIPITATION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of California Riverside, CA 92521	Robert Musselman	$65,000	09/15/85	09/30/86	Effects of Acidic Fog on Agricultural Crops in California
Yale Univ. New Haven, CT 06520	William Smith	$106,605	08/01/85	07/31/88	Rhizosphere Regulation of Heavy Metal Uptake by Forest Trees
Univ. of Illinois Urbana, IL 61801	Donald Dolske	$70,000	09/01/85	08/31/86	A Field Study of Dry Deposition of Airborne Materials to Soybeans and Corn
Univ. of Illinois Urbana, IL 61801	Wayne Banwart	$118,000	09/01/85	08/31/87	Differential Cultivar Response to Acidic Precipitation
Univ. of Minnesota St. Paul, MN 55104	Edward Sucoff	$48,000	09/15/85	03/31/87	Al in the Soil Solution of the Rhizosphere: Effected on Root Viability in Pine and Oak
North Carolina State University Raleigh, NC 27695	Denis DuBay	$85,000	09/15/85	09/30/87	The Effects of Atmospheric Pollutants on the Reproduction of Agricultural Crops

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: ACID PRECIPITATION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Rutgers, The State University New Brunswick, NJ 08903	Gene Hall	$30,000	09/15/85	09/30/87	Element Analysis of Precisely-dated Tree Rings to Study Causes of Growth Decline
Columbia Univ. New York, NY 10027	Gordon Jacoby, Jr.	$22,111	09/15/85	09/30/87	Element Analysis of Precisely-dated Tree Rings to Study Causes of Growth Decline
Ohio State Univ. Res. Fdn. Columbus, OH 43212	James McClenahen	$52,200	09/01/85	08/31/88	Acidic Deposition Histories Using Multi-elemental Tree-ring Analysis
Ohio State Univ. Res. Fdn. Columbus, OH 43212	Benjamin Stinner	$26,738	09/01/85	08/31/86	Effects of Acid Precipitation on Arthropod Fauna in Conservation Tilled Corn Systems
Northeastern Forest Expt. Station Forest Service, USDA Broomall, PA 19008	Keith Jensen	$43,755	09/01/85	02/28/87	Impact of Ozone and Aluminum on Pitch Pine and Yellow Poplar Seedling Growth

TOTAL $867,409

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: ANIMAL SCIENCE - REPRODUCTIVE EFFICIENCY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of California Davis, CA 95616	Jerry L. Hedrick	$382,000	09/15/85	09/30/88	Fertilization in the Pig
Univ. of Georgia Res. Fdn. Athens, GA 30602	Terry Kiser	$130,000	09/15/85	09/30/88	Opiate Regulation of Luteinizing Hormone in the Postpartum Anestrous Beef Cow
Iowa State Univ. of Science & Technology Ames, IA 50011	Lloyd L. Anderson	$100,750	09/15/85	09/30/88	Regulation of Relaxin and Progesterone Secretion by Aging Porcine Corpora Lutea
Univ. of Illinois Urbana, IL 61801	Janice M. Bahr	$175,000	09/15/85	09/30/88	Effect of Age on Reproductive Efficiency of the Domestic Hen
Purdue Res. Fdn. West Lafayette, IN 47907	P. V. Malven	$199,000	09/01/85	08/31/88	Involvement of Endogenous Opioids in the Postpartum Inhibition of LH
Univ. of Minnesota St. Paul, MN 55104	M. E. El Halawani	$181,000	09/15/85	09/30/88	Modulation of Reproductive Efficiency by Prolactin in Domestic Turkey

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: ANIMAL SCIENCE - REPRODUCTIVE EFFICIENCY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Missouri Columbia, MO 65211	B. N. Day	$139,000	09/01/85	08/31/87	Effect of Intrauterine Position on Subsequent Reproduction and Behavior in Swine
North Carolina State Univ. Raleigh, NC 27695	Jack H. Britt	$245,000	09/01/85	08/31/88	Control of Ovarian Folicular Development in the Pig
Univ. of Nevada Reno, NV 89557	Duane L. Garner	$222,000	09/01/85	08/31/88	Automated Assessment of Bovine Sperm Fertilizing Potential
Cornell Univ. Ithaca, NY 14853	Robert Corradino	$321,000	09/01/85	08/31/88	The Role of Calcium in Bovine Corpus Luteum Function
Ohio State Univ. Res. Fdn. Columbus, OH 43210	William F. Pope	$140,000	09/15/85	09/30/88	Estrogenic Alteration of Uterine Activity Affecting Embryo Survival in Swine
Texas A&M Res. Fdn. College Station, TX 77843	David W. Forrest	$34,000	09/15/85	09/30/86	Endocrine Control of Bioactive Luteinizing Hormone during Sexual Maturation

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: ANIMAL SCIENCE - REPRODUCTIVE EFFICIENCY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Washington State Univ. Pullman, WA 99164	Lynette B. Corbeil	$132,000	09/01/85	08/31/88	Suboptimal Bovine Reproductive Efficiency: Trichomoniasis

TOTAL $2,400,750

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: ANIMAL SCIENCE - BRUCELLOSIS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Agricultural Research Service, USDA P.O. Box 70 RR #2 Ames, IA 50010	L. B. Tabatabai	$171,000	09/01/85	08/31/88	Recombinant Brucella Proteins for Vaccines and Diagnostic Reagents
Cornell Univ. Ithaca, NY 14853	Alexander Winter	$149,000	09/15/85	09/30/87	Protection Induced in Rats to Brucella abortus by Viable and Nonviable Vaccines
Virginia Polytechnic Inst. & State Univ. Blacksburg, VA 24061	Gerhardt Schurig	$160,150	09/01/85	08/31/88	Cloning of B. Abortus Antigens Involved in Protective Immunity
	TOTAL	$480,150			

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: ANIMAL SCIENCE - REPRODUCTIVE PHYSIOLOGY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of California Davis, CA 95616	Thomas E. Adams	$173,000	09/01/85	08/31/88	Endocrine Control of Ovulation in Sheep Actively Immunized Against GnRH
Univ. of Florida Gainesville, FL 32610	Peter J. Hansen	$225,000	09/15/85	09/30/88	The Function of Proteins Secreted by the Periattachment Bovine Conceptus
Kansas State Univ. Manhattan, KS 66506	D. L. Davis	$207,800	09/01/85	08/31/88	Embryonic Signals in Pregnancy Establishment in the Pig
Cornell Univ. Ithaca, NY 14853	Douglas F. Antczak	$209,800	09/01/85	08/31/88	Invasive Trophoblast in the Genus Equus
Pennsylvania State Univ. University Park, PA 16802	Gary J. Killian	$215,850	09/01/85	08/31/88	Bovine Oviductal Fluid Biochemistry and its Relationship to Gamete Physiology
Agric. Expt. Station Univ. of Tennessee Knoxville, TN 37901	James D. Godkin	$220,000	09/15/85	09/30/88	Bovine Fetal-Maternal Interactions

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: ANIMAL SCIENCE - REPRODUCTIVE PHYSIOLOGY

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Wisconsin Madison, WI 53706	Linda A. Schuler	$92,000	09/15/85	09/30/87	Synthesis and Characterization of Recombinant DNA-produced Bovine Placental Lactogen
Univ. of Wisconsin Madison, WI 53706	Roy L. Ax	$97,000	09/15/85	09/30/87	Characteristics of Glycosaminoglycan Binding Sites in Ovarian Follicles of Cows

TOTAL $1,440,450

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: ALCOHOL FUELS RESEARCH

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Purdue Res. Fdn. West Lafayette, IN 47907	Nancy W. Y. Ho	$60,000	09/01/85	08/31/87	Improvement of Yeast Alcohol Fermentation via Genetic Engineering
Univ. of Massachusetts Amherst, MA 01003	E. Canale-Parola	$82,583	09/01/85	08/31/87	Cellulases and Hemicellulases of Ethanol-producing Mesophilic Bacteria
North Carolina State Univ. Raleigh, NC 27695	Leo W. Parks	$95,489	08/01/85	07/31/87	Cell Membrane Technology in the Fermentative Production of Alcohol
Agric. Expt. Station Cook College Rutgers Univ. New Brunswick, NJ 08903	Douglas Eveleigh	$103,000	09/01/85	08/31/87	Alcohol Fuel from Zymomonas: Genetic Approaches to Enhance its use of Biomass
Cornell Univ. Ithaca, NY 14853	Robert K. Finn	$77,500	09/01/85	08/31/87	Novel Bacterial Route for Fermenting Agricultural Residues to Alcohol

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: ALCOHOL FUELS RESEARCH

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Lehigh Univ. Bethlehem, PA 18015	B. S. Montenecourt	$99,990	08/01/85	07/31/87	Formation of Interspecies Hybrids of Solvent-producing Clostridia

TOTAL $518,562

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: INSECT PEST SCIENCE - BOLL WEEVIL/BOLLWORM

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Arizona Tucson, AZ 85721	William S. Bowers	$80,000	09/15/85	09/30/87	Regulation of Insecticide Transport and Metabolism by Hemolymph Proteins in the Bollworm
Univ. of California Davis, CA 95616	Bruce D. Hammock	$168,000	09/01/85	08/31/88	Affinity Purified JH Esterase and Its Gene for Bollworm Control
Agricultural Research Service, USDA P.O. Box 70, RR #2 Ames, IA 50010	Thomas A. Coudron	$124,500	09/01/85	08/31/88	Enzymatic Action in the Mode of Entry of Nomuraea rileyi into Heliothis Larvae
Univ. of Kentucky Res. Fdn. Lexington, KY 40506-0057	Douglas L. Dahlman	$80,000	09/01/85	08/31/87	Endocrinology of Heliothis-Parasite Interactions
Mississippi Agric. & For. Expt. Stn. Mississippi State Univ. Mississippi State, MS 39762	Sonny B. Ramaswamy	$77,800	08/01/85	07/31/87	Sensory Receptors and Cues for Oviposition by heliothis (Noctuidae)

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: INSECT PEST SCIENCE - BOLL WEEVIL/BOLLWORM

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Agricultural Research Service, USDA P.O. Box 225 Stoneville, MS 38776	J. E. Powell	$100,000	09/15/85	09/30/87	Monitoring Parasitism of Heliothis spp. with Microplitis croceipes Sex Pheromone
Agricultural Research Service, USDA P.O. Box 225 Stoneville, MS 38776	Keith R. Hopper	$90,000	09/01/85	08/31/87	Effect of Heliothis Abundance on Control by Parasitic Wasps
North Carolina State Univ. Raleigh, NC 27695-7003	Fred L. Gould	$120,000	09/01/85	08/31/88	Assessing the Genetic Potential of Heliothis spp. to Adapt to Resistant Crop Varieties
Texas A&M Res. Fdn. College Station, TX 77843	J. R. Cate	$120,000	09/15/85	09/30/87	Ecology, Host Relationships and Biosystematics of the Boll Weevil
	TOTAL	$960,300			

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: PEST SCIENCE - GYPSY MOTHS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Kentucky Res. Fdn. Lexington, KY 40506	Thomas W. Kimmerer	$70,000	09/01/85	08/31/87	Role of Host Volatiles in Interaction Between Agrilus Bilineatus and Oaks
Univ. of Massachusetts Amherst, MA 01003	Joseph S. Elkinton	$180,000	09/01/85	08/31/88	Effect of Vertebrate Predation on Gypsy Moth Population Dynamics
Univ. of Massachusetts Amherst, MA 01003	Ring T. Carde	$245,000	08/01/85	07/31/88	Orientation of Flying Gypsy Moths to Pheromone
Res. Fdn. of State Univ. of New York Albany, NY 12201	Glenn D. Prestwich	$251,000	09/15/85	09/30/88	Pheromone Biochemistry of Gypsy Moths
Univ. of Oregon Eugene, OR 97403	George C. Carroll	$42,000	08/01/85	07/31/86	Fungal Egg-parasites of the Gypsy Moth: A Significant Cause of Egg Mortality?
Northeastern Forest Expt. Station Forest Service, USDA 370 Reed Road Broomall, PA 19008	Thomas M. Odell	$72,300	09/01/85	08/31/87	Genetic Markers for Identifying Gypsy Moth Populations

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: PEST SCIENCE - GYPSY MOTHS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Pennsylvania State Univ. University Park, PA 16802	J. C. Schultz	$100,000	09/01/85	08/31/87	Impact of Food Quality and Gut Physiology on Gypsy Moth Susceptibility to a Baculovirus

TOTAL $960,300

COMPETITIVE RESEARCH GRANTS

Mr. WHITTEN. Do you feel the land-grant institutions can compete successfully for these grants?

Dr. JORDAN. Historically, approximately 65% of the Competitive Research Grants have been awarded to the land-grant institutions. This indicates that they have been very successful in competing for these grants and I believe that they will continue to receive a large proportion of the grants awarded.

SPECIAL RESEARCH PROGRAMS

Mr. WHITTEN. If Congress should agree with your proposal to eliminate the special research grants, do you not think that some of the research that might be of interest to a particular State or region might be dropped in favor of research that stands a better chance of securing a portion of the competitive research funds?

Dr. JORDAN. With the elimination of the special research grants and level funding of the formula programs it will be necessary to reassess research priorities. In this process it is anticipated that the States will have to adjust their research programs, including the level of support for some projects currently funded through the special research grants program. Some projects currently being funded by special research grants may be continued through the competitive research grants programs especially those concerned with basic research critical to food production. The competitive research grants program is complimentary to the formula based and special research grants programs.

SPECIAL RESEARCH GRANTS

Mr. WHITTEN. Since you are proposing to eliminate the special research grants, we would like for you to discuss each one in detail. For each of the special research grants please answer the following questions:

SOIL EROSION RESEARCH IN THE PACIFIC NORTHWEST (STEEP)

Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. This is a three-State multidisciplinary research and development program titled, "Solutions to Environmental and Economic Problems: An Erosion Project for the Pacific Northwest." The Program focuses on the unique problems of reducing soil erosion and water runoff from the complex and finely textured soils of that region while maintaining or improving potential productivity of the soils. An integrated systems approach to research carried out by the three State Agricultural Experiment Stations—SAES—and USDA-ARS has been used to study tillage and crop management systems that show potential for reducing soil erosion. These studies have considered the relationship between conservation tillage and each of the following: wheat cultivar response, soil physical factors, short term economics, weather conditions, fertilizer management, soil freezing and thawing, insects and diseases. Other issues being studied include breeding and selection of adapted crop cultivars, improved prediction of erosion and runoff, and the socioeconomic

impacts of erosion and erosion control programs of the region. The authorization period for grants awarded in FY 1986 is to fund research through FY 1988.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

The STEEP project has been supported by Special Research Grants for 11 years. Grants have been awarded from funds appropriated as follows: FY 1976, $200,000; FY 1977, $350,000; FY 1978-80, $450,000; FY 1981, $600,000; FY 1982-85, $622,000; FY 1986, $618,000 or $591,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. It is being conducted in Idaho, Washington, and Oregon by scientists at the Agricultural Experiment Stations in these states.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Major accomplishments to date include identification of tillage and crop management systems that significantly reduce erosion while maintaining crop yields. A computer simulation model is being perfected to assess the relationships between conservation tillage and other production factors such as: crop variety, soil physical condition, economics, weather conditions and fertilizer needs. This base of new technology when fully implemented will bring about significant reduction in soil erosion. Some of these techniques have already been adopted by wheat growers of the region. Additional work is needed to understand the impact of soil freezing and thawing, long term soil physical conditions caused by the new technologies, and definitive impacts of insects and diseases on crop production under conservation tillage systems. Lastly, research on effective technology transfer systems is needed to facilitate adoption and use of this information. Funding support which expands and enhances this Special Research Grants program also comes from State appropriations and private sources. Budgets of the three SAES show their contributions as: Idaho, $536,000; Oregon, $320,000; Washington, $450,000. In addition, approximately $738,000 is annually contributed by the wheat grower associations of Idaho, Washington, and Oregon. Research grants funded in fiscal year 1986 and in prior years may be used over a period of up to five years to complete the studies proposed in the grants.

Mr. WHITTEN. What is the estimated cost of completing this work?

Dr. JORDAN. Because of the long term nature of the research in this program, an initial life expectancy was projected as being 15 years, through 1990. The three participating institutions have submitted information to CSRS indicating that annual funding of over $300,000 for each experiment station is required in addition to state and private sources to complete the planned research. This would amount to $3.6 million.

DRIED BEAN RESEARCH, NORTH DAKOTA

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Improved cultivars of edible dry beans, adapted to North Dakota growing conditions, with good disease resistance, nitrogen fixing efficiency, protein quality, cooking quality, and pod and seed dry matter accumulation have been developed. Cultural recommendations required for optimal growth and yield have also been developed. The FY 1986 grant proposal has been received and is in the process of being awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1977–1981, $25,000; FY 1982, $24,000; FY 1983–1984, $25,000; FY 1985–1986, $50,000 or $48,000 under Gramm-Rudman-Hollings in 1986.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at the North Dakota Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. New pinto bean varieties, "Pindak," "Holberg," and "Nordak," were released by the North Dakota State Agricultural Experiment Station in 1981, 1982, and 1984, respectively. Many new cultivars with improved disease resistance, plant type, yield, and other useful characteristics have been identified and incorporated into the breeding program. Research on dry matter accumulation, disease resistance, nitrogen fixation, protein quality, yield, and improved production practices is continuing. Research grants funded in FY 1986 and prior years may be used over a period of up to five years for completion of the studies proposed in the grants.

FOOD SYSTEMS RESEARCH GROUP, WISCONSIN

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. The research focuses on the organization and performance of the U.S. food system. Particular emphasis is placed on factors affecting the competitiveness of U.S. industries and markets, including new technology, market structure, and government policies/regulations. The effects of biotechnologies, mergers, commodity advertising programs, international competition, and changes in government regulations will be examined during the present grant. The fiscal year 1986 proposal is in the process of preparation and will be received soon.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1976–1981, $150,000; FY 1982–1986, $156,000 or $148,000 under Gramm-Rudman-Hollings in 1986.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The grant supports a core research group at the Wisconsin Agricultural Experiment Station which provides leadership and coordination of research being conducted at 18 Agricultural Experiment Stations and ERS, USDA. The work is organized

and being conducted under North Central Regional Project 117, Organization and Control of the U.S. Food Production System.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Considerable knowledge has been developed on how the food system is organized, coordinated, and affected by market structure and government regulations. Past research has received two national awards: the 1980 American Agricultural Economics Association—AAEA—award for distinguished policy contributions and the 1985 Quality of Communications award for the book titled "The Food Manufacturing Industries." However, the 1980's have witnessed dramatic changes in farming, in the organization of food marketing industries, in public policies toward the food system, and in the economic theories of markets. One of the major unresolved issues is the factors that affect market performance, and therefore the appropriate roles for antitrust and other government policies. A second major issue is the extent to which industry consolidation, new technologies, and international competition have affected the performance of U.S. agricultural industries and markets. These are the issues on which research under this grant will focus. Publications to date include: 30 books, monographs, chapters in books and congressional committee prints; 2 special reports; 40 journal papers; and 110 working papers and miscellaneous publications. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to 5 years for completion of the studies proposed in the grants.

INTEGRATED PEST MANAGEMENT

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. The goal of integrated pest management research is to provide knowledge for the management of major crop ecosystems and to use this knowledge in the development of systems of management that significantly reduce yield losses, increase production efficiency and profitability, optimize economic return to producers and society, and minimize damage to the environment. Integrated pest management has made a progressive transition from a University consortium program to a National IPM program that will integrate systems-ecological strategies and biotechnological breakthroughs with future integrated crop systems; coupled with extension/research technology transfer that is using modern age electronic delivery systems. A National Symposium for Integrated Pest Management on Major Managed Agricultural Systems, held in the National Academy of Sciences Auditorium on October 8-10, 1985, summarized research achievements in four major cropping systems, and emphasized the future focus on biotechnological interactions and the methodologies to exploit these potentials. Proceedings from the symposium will highlight the significant advances made in reducing production costs in the soybean, cotton, alfalfa, and apple ecosystems, and will provide a listing of the scientific publications resulting from the program. Additional analyses have been conducted on 10 commodities to determine key factors contributing to current crop losses, and priority research has been

identified to improve productivity and attain the genetic potential of the crop in its environment; genetic potential that may be markedly improved in the biotechnological era. A regional/national competitive grant program opened to the best scientists in the entire Land-Grant System is in place to solicit and award most promising research projects on priority areas identified as significant barriers to productivity. Approximately $1,250,000 of the resources in FY 84, and all resources in FY 85 and 86 are being directed toward identified priority research areas under the National Integrated Pest Management Program. In FY 86 research proposals are being solicited for competitive peer review in the following commodity areas: alfalfa, potatoes, range, small grains, tree fruits, corn, confined livestock, dairy forage, applies, cotton, and soybeans. Additional commodity areas are currently being identified.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated to CSRS as follows: FY 1981, $1,500,000; FY 1982–1985, $3,091,000; FY 1986, $3,073,000 or $2,940,000 under Gramm-Rudman-Hollings. The Consortium for Integrated Pest Management has received funding from both EPA and USDA over the period FY 1979–1985. The National Program for Integrated Pest Management received funds from FY 1984 through FY 1986.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Currently the research is being conducted at 36 State Agricultural Experiment Stations. Proposals have been solicited from the entire State Agricultural Experiment Station System in the priority research areas identified by the four regional IPM programs. Outstanding scientific proposals in the priority areas identified by the IPM program have been selected by an interdisciplinary peer review process.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. An excellent process has been developed in the IPM program to determine the most significant problems, to focus research dollars on these problems, to recruit outstanding and innovative researchers in the interdisciplinary sciences to address identified problems, and to incorporate new knowledge into the decision process. For example, potatoes are the biggest users of pesticides of the vegetable crops in the North Central Region. A systems approach was used to identify the knowledge base for potato pest management, identify the extent of ongoing research, identify the importance of different pests and topic areas for research, and incorporate these topics into the guidelines for competitive funding of IPM research to lead to improved resource allocation and greater accountability of new knowledge to improve IPM via the program. Three computer models for predicting potato plant growth, tuber yield, and pest submodels are being developed in the North Central Region under the IPM program. New knowledge relative to pest/plant interactions such as current research supported by the IPM program on the highly contagious bacterial ring rot disease will be incorporated into future versions of the predictive model for improved decision making. For example, bacterial ring rot continues to cause severe losses in the potato growing regions of the United

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: INSECT PEST SCIENCE - PINE BARK BEETLE

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Arkansas Fayetteville, AR 72701	F. M. Stephen	$87,310	09/15/85	09/30/87	Host Resistance/Suitability: Mechanisms and Impact on Dendroctonus Populations
Univ. of California Berkeley, CA 94720	David L. Wood	$271,600	09/01/85	08/31/88	Bark Beetles as Indicators of and Contributors to Stress in Pondorosa Pine
Univ. of Florida Gainesville, FL 32611	James L. Nation	$104,060	09/01/85	08/31/87	Chemical Ecology of the Black Turpentine Beetle, Dendroctonus terebrans
Univ. of Georgia Res. Fdn. Athens, GA 30602	C. Wayne Berisford	$197,330	09/01/85	08/31/88	Evaluation of Regional Differences in Aggregating Pheromones of the Southern Pine Bark Beetle
North Carolina State Univ. Raleigh, NC 27695	Fred P. Hain	$120,000	09/15/85	09/30/87	Host Resistance of Southern Yellow Pines to Bark Beetle Attack
Texas A&M Res. Fdn. College Station, TX 77843	Thomas L. Payne	$80,000	09/01/85	08/31/87	Sensory Basis of Interspecific Olfactory Communication in Southern Pine Bark Beetle Complex

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: INSECT PEST SCIENCE - PINE BARK BEETLE

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Brigham Young Univ. Provo, UT 84602	Rex G. Cates	$100,000	09/15/85	09/30/87	Host Resistance/Suitability: Mechanisms and Impact on *Dendroctonus* Populations

TOTAL $960,300

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: SOYBEAN RESEARCH

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Georgia Res. Fdn. Athens, GA 30602	R. S. Hussey	$61,589	09/15/85	09/30/87	Quantification of Soybean Cyst Nematode Damage to Soybean Root Systems for Integration into Crop
Univ. of Nbrth. Iowa Cedar Falls, IA 50614	Virginia S. Berg	$53,577	09/15/85	09/30/87	Leaf Orientation, Water Stress and Photosynthesis in Soybeans
Purdue Res. Fdn. West Lafayette, IN 47907	April C. Mason	$85,000	09/15/85	09/30/87	Characterization of the Form of Selenium in Soybean
Agric. Expt. Station Univ. of Kentucky Lexington, KY 40546	Dennis B. Egli	$83,750	09/15/85	09/30/89	The Genotype x Environment Interaction for the Duration of Seed Fill in Soybeans
Agric. Expt. Station Univ. of Kentucky Lexington, KY 40546	Todd W. Pfeiffer	$51,519	09/15/85	09/30/87	Genetic Variation for Recombination Levels in Soybean
Univ. of Minnesota St. Paul, MN 55104	William A. Brun	$62,000	09/15/85	09/30/87	Soybean Seed Growth Responses to Intermittent Water Stress

COMPETITIVE RESEARCH GRANTS PROGRAM
PROGRAM AREA: SOYBEAN RESEARCH

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Univ. of Missouri Columbia, MO 65211	Virgil D. Luedders	$100,000	09/15/85	09/30/87	Genetics of the Cyst Nematode-Soybean Association

TOTAL $497,435

States. Nearly 50 percent of the ring rot cases have no traceable inoculum source. Recently, sugar beet has been shown to be a natural host for ring rot under agricultural conditions. Current IPM research is evaluating the importance of sugar beet source of ring rot and to more closely examine related weed species in order to more fully understand the IPM impacts of additional host species. To aid in this evaluation, a rapid sensitive hybridization assay using a species specific recombinant DNA probe is being developed that will have a positive major impact on virtually all areas of applied bacterial ring rot research and disease management for screening of non-host crop and weed species, soil sample, and potential insect vectors for the presence of ring rot, all of which are viable candidates for enhancing the survivability and spread of ring rot. A hybridization assay may also detect symptomless, latent infections in certified seed stock. Also to be incorporated into the predictive decision model will be the research on pesticide resistance management, especially with pests such as the Colorado potato beetle, which has developed resistance to practically all classes of insecticides available. Specifically there is little or no information on dispersal and movement of Colorado potato beetles between sites—gene flow, and the sources, genetics and heritability of insecticide resistance. Ongoing resistance research will complement advances being made in the development of biological and cultural control measures being developed for the Colorado potato beetle. Additional examples can be given for the other commodities under study in the IPM program. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of the studies proposed in the grants.

PESTICIDE CLEARANCE

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Scientists representing the State Agricultural Experiment Stations and the U.S. Territories have defined and updated the pest control technologies needed for farmers, grocers, ranchers, and homeowners in their areas. These needs would be resolved through issuance of new Federal registrations of pesticides and biological control agents for use on minor and specialty crops. Researchers are conducting field trials on many of the identified high priority needs to determine their effectiveness, safety, and usefulness and thus their potentials for Federal registration. In concert with this, analytical chemical laboratory studies are being carried out, where appropriate, to identify and quantify any residues that may persist in food or feed crops after treatment. Fiscal year 1986 grant proposals have been received and are in the process of being awarded. Grants awarded in fiscal year 1986 extend through January, 1989.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: Program redirection in fiscal year 1975 of $250,000; fiscal year 1976, $500,000; fiscal year 1977–80, $1,000,000; fiscal year 1981, $1,250,000; and fiscal years 1982–85, $1,440,000; fiscal year 1986, $1,431,000 or $1,369,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is the work being carried out?

Dr. JORDAN. Field plot research on pesticide efficacy and safety is in progress at most of the agricultural experiment stations in the States and in U.S. Territories. The stations located in California, Florida, New York, and Michigan serve as regional centers and coordinate activities. In addition, the four regional centers have facilities and staff to perform essential analytical chemical assessments of residues in harvested products. The New Jersey station serves as national headquarters and provides liaison with Federal regulatory agencies.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Based upon data supplied by the program, a total of 461 tolerances for residues of pesticides in minor or specialty food crops have been established. A backlog of 625 State requested research projects on food crops remains to be addressed. The annual rate of pesticide clearance requests received from the States is approximately 252, and from 50–80 pesticide residue tolerances are obtained annually. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of the studies proposed in the grants.

MINOR USE ANIMAL DRUGS

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contracts.

Dr. JORDAN. In 1982, Interregional Research Project No. 4—IR–4—was revised to include efforts to obtain FDA clearance of animal drugs intended for use in minor species and for minor use in the major species. To initiate the drug clearance program, Fiscal Years 1982–86 Special Research Grant funds were divided equally between the four IR–4 regional leader laboratories located in New York, Michigan, Florida and California and IR–4 Headquarters at Rutgers University. These funds are being utilized by the leader laboratories and by allocation to State Agricultural Experiment Stations—SAES—to develop data required for meeting clearance requirements. The research component of the IR–4 program consists of the leader laboratories, SAES, ARS, schools of veterinary medicine and the drug industry. The fiscal year 1986 grants awarded will support work through April 1988.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1982–85, $240,000; FY 1986, $239,000 or $229,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The grants have been awarded to the four IR–4 regional leader laboratories and to IR–4 Headquarters, Rutgers University. The research is conducted by these laboratories and through allocation of these funds for specific experiments at the State Agricultural Experiment Stations, the Agricultural Research Service, the USDI Fish and Wildlife Service and in conjunction with 15 pharmaceutical companies.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Since January 1983, 127 drug requests have been submitted to IR-4 Headquarters. Four have been approved and thirty-five drug requests are in the research stage. Eighty-six drug requests are in various stages of evaluation and three cannot be cleared because of significant data gaps. The 35 research projects have been established in cooperation with 16 universities, USDI-Fish & Wildlife Service, USDA-Agricultural Research Service and 15 pharmaceutical companies. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of the studies proposed in the grants.

PESTICIDE IMPACT ASSESSMENT

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Funds appropriated for the CSRS Pesticide Impact Assessment Program support participation of scientists associated with the State Agricultural Experiment Stations in this USDA program. A portion of these funds is used for state assessment activities, and in conjunction with the Extension Service is used to maintain a network of State Liaison Representatives, who serve as authorities on pesticide needs and activities. In addition, grant funds distributed regionally through four lead states support investigations by scientists in each region targeted to generate data which is needed to make scientifically sound decisions on pesticide regulatory issues. Through a process of regional priority setting, research is directed to the most urgent issues surrounding the use of pest control chemicals.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: fiscal years 1977-1981, $1,810,000; fiscal years 1982-1985, $2,069,000; fiscal year 1986, $2,057,000 or $1,968,000 under Gramm-Rudman-Hollings. For fiscal years 1977-1982, $300,000 was available within the limitation for Federal Administration, direct appropriation, for State participation in pesticide impact assessment teams. Beginning in fiscal year 1983, this State participation is provided within funding for pesticide impact assessment under Special Research Grants.

Mr. WHITTEN. Where is the work being carried out?

Dr. JORDAN. This research is being conducted at Land-Grant Institutions in 53 States and Territories. The regionally distributed funds are coordinated through California AES—West, Ohio AES—North Central, Pennsylvania AES—Northeast, and South Carolina AES—South.

Mr. WHITTEN. What has been accomplished to date, and what work remains to be done?

Dr. JORDAN. This program has made it possible to address pesticide problems through research on a national scale. Responses and data from SAES scientists, on issues related to environmental fate, resistance, potential exposure hazards and crop loss have played an important role in pesticide regulatory decisions. The area of environmental fate, particularly the movement of pesticides into water, has received a high priority in funding, and preliminary data indi-

cate agricultural practices could be altered to avoid pollution problems. Research on exposure indicates levels can be reduced through application technology and protective equipment. Research in the areas of resistance and economic benefits have also provided a much needed data base. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of the studies proposed in the grants.

RURAL DEVELOPMENT CENTERS

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. The four Regional Centers for rural development provide assistance in coordinating both research and extension programs in rural and community development at the State land-grant universities. Since many of the issues affecting rural people and places have regional and interregional components, they can be addressed more effectively and efficiently through regional cooperation among the State institutions. The centers assist in the initiation and coordination of these cooperative efforts. In addition, the Centers provide opportunities for faculty at State institutions to focus research on regional or multistate problems by affiliating with the Center on short-term assignments. This permits a concentration on issues that cannot be accomplished by individual State scientists operating alone.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1971, $75,000; FY 1972, $225,000; FY 1973, $317,000; FY 1974–FY 1981, $300,000; FY 1982–FY 1985, $311,000; FY 1986, $379,000 or $363,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is the work being carried out?

Dr. JORDAN. The four Regional Rural Development Centers are located at the Pennsylvania State University, Northeast; Iowa State University, North Central; Mississippi State University, Southern; and Oregon State University, Western. However, most of the research is actually performed at the various land-grant universities in the respective region.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. The Centers have provided continuous planning and coordination for research conducted by the States in their respective regions. Recent research and related activities include: A study by the Western Rural Development Center focused on the relationship between satisfaction with land use policies and the need for economic development. Colorado citizens were more dissatisfied with current land use policies and services than with all other public policies and services, but there was disagreement regarding the effects of land use policy on economic development. Forty three percent of the dissatisfied believed land use policy discouraged economic development, while 33 percent felt it aided development. Urban residents were more likely to believe that land use policy aided development and rural residents were more likely to believe that it discouraged development. Thus, land use policy was vilified

by two opposing groups. Community resource development specialists can now help local officials to understand the nature of this conflict and hopefully develop land use policies and economic development initiatives that are not in conflict with each other. A Northeast Center study of the population impacts in the New England States found population growth in the northern part—Vermont, New Hampshire, Maine—to be more than 18 times the growth in the southern part—Massachusetts, Connecticut, Rhode Island. Small places, under 500 population, had the fastest growth of all, but this has strained the budgets of their local governments due to the demand for services increasing faster than revenue income. These population changes are driven by the economic revitalization of the New England region. This region is the first to complete the economic cycle of industrialization, deindustrialization, and reindustrialization. As such it may serve as a model for the revitalization of other sections of the United States that have suffered deindustrialization due to the flight of manufacturing firms to foreign countries. Both the North Central and Southern Centers have multiple activities relating to the financial crises on farms and rural communities in their regions. In particular, the linkages between agriculture and its support mechanisms in the small towns and rural communities is under intense study. Results of these studies have not yet been formally reported. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of studies proposed in the grants.

SOYBEAN CYST NEMATODE RESEARCH—MISSOURI

Mr. WHITTEN. Fully describe the work that has been under this program to date and the period of the existing contract.

Dr. JORDAN. Crop rotation studies showed that yields of soybeans were greater when grown in rotation than when grown in soybeans continuously. Including a non-host crop, and rotating soybean cyst nematode—SCN—resistant germplasm with susceptible germplasm are effective means to manage yield depression caused by the nematode. Genetic crossing studies show different types of inheritance. In one group inheritance seems to be located at common loci in parental lines, and in another group, genes at different loci differing by one or two genes are indicated. Crop residue studies in double-cropping plots showed that increasing residue levels of wheat straw are correlated with declines in SCN soil populations. However, late-planted soybeans in double-cropping yielded less than crops planted at mid-season in the conventional system. Fiscal year 1986 grant funds have been made available to the Missouri Station, pending receipt, review and approval of the research proposal.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1979, $150,000; FY 1980–81, $250,000; FY 1982, $240,000; FY 1983–85, $300,000; FY 1986, $298,000 or $285,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the Missouri Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Research findings to date show that this nematode survives in the soil over prolonged periods in the absence of a host crop. Life cycle diapause appears to be an important mechanism of nematode survival. Thus, research will be conducted on ways to disrupt dormancy periods, making the nematode active when the host plant is absent, forcing the pest into starvation. Artificial cultures of nematodes will be studied further, as a method for: study of population survival, screening for soybean resistance, and study of the genetics of pathogenicity and race evolution of SCN. Soybean germplasm will be studied under different temperature and soil pH levels to determine what effects environment may have on resistance gene expression. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of the studies proposed in the grants.

BEAN AND BEET RESEARCH, MICHIGAN

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. This research project has helped to: identify the morphological and physiological mechanisms which maximize the efficiency of water use by dry edible bean genotypes; develop soil and crop management systems which enhance dry edible bean yields on the fine textured soils in Michigan; study environment by genotype interactions for root development of stress tolerant and sensitive genotypes of dry edible beans; determine the efficiency of carbon use by sugarbeet; and integrate plant growth, soil, and environmental conditions for maximum yield management systems into the Crop Environmental Resource Simulation prediction models for dry edible beans and sugarbeets. The FY 1986 grant proposal has been received and is in the process of being awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1978, $45,000; FY 1979, $50,000; FY 1980, $50,000; FY 1981, $75,000; FY 1982, $82,000 FY 1983 through FY 1986, $97,000 or $93,000 under Gramm-Rudman-Hollings in FY 1986.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted by the Michigan State Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. The research on the morphological and physiological mechanisms affecting soil water usage by plants has been useful in developing soil and crop management recommendations for optimal production of dry edible beans and sugarbeets in the Saginaw Valley and other areas in Michigan and the U.S. Research grants funded in FY 1986 and prior years may be used over a period of up to five years for completion of the studies proposed in the grants.

ANIMAL HEALTH RESEARCH

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Research conducted under Animal Health Special Research Grants has centered on solution of the highest priority animal health problems as identified by the Animal Health Science Research Advisory Board. This research is developing and refining methods to prevent or reduce animal health losses due to infectious and noninfectious diseases and parasites in livestock, poultry, and major aquaculture species. Practical preventive measures and implementable health management systems are being developed to assist producers in preventing or reducing major causes of animal health losses. Awards made in fiscal year 1986 will support projected research for periods up to 5 years. The fiscalo year 1986 deadline for submission of proposals was March 10, 1986. The proposals will be evaluated by peer panels and final selection of those to be funded is expected to be completed by June.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: fiscal year 1979, $10,000,000; fiscal year 1980, $7,000,000; fiscal year 1981, $5,050,000; fiscal years 1982–1984, $7,156,000; fiscal year 1985, $6,000,000; fiscal year 1986, $5,964,000 or $5,705,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted in the State Agricultural Experiment Stations, the colleges and schools of veterinary medicine, and in other cooperating colleges and universities having animal health expertise.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. A number of significant accomplishments have been made in research supported by this program. These include the development of new or improved vaccines for vesicular stomatitis and anaplasmosis, which are very important diseases of cattle. Research is underway to develop new vaccines for trichomoniasis, bluetongue disease of sheep, equine infectious anemia, staphyloccal mastitis, bovine respiratory disease, E. coli infections and bovine viral diarrhea. Improved and more accurate diagnostic tests have been developed, primarily using molecular biotechnology for mycoplasma infections in chickens, bluetongue in sheep, Johnes disease, Chlamydial infections, retrovirus infections of sheep and goats, pseudorabies, channel catfish virus disease in catfish, and Hemophilus infection and vesicular stomatitis in cattle. New treatment or control measures have been developed for preventing respiratory disease of cattle, milk fever, cancer eye, grass tetany, intestinal parasites in cattle, foot rot and coccidiosis in sheep. Improved tests have been developed to detect pesticides and drugs in animal products. Many other scientific advances have been made in clarifying the causes of enteric, respiratory and reproductive diseases in food animals and in determining the complex mechanisms involved in resistance or the immune response to these diseases. This information will lead to the development of improved prevention and con-

trol procedures in the future. Additional research to develop better diagnositc methods and control procedures for the major economic disease problems of food animals needs to be done. Research grants funded in fiscal year 1986 and prior years will be used over a period of up to 5 years for completion of the studies proposed in the grants.

AQUACULTURE RESEARCH, STONEVILLE, MISSISSIPPI

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. The primary objectives of this research are to develop practical feeds and feeding regimes, improve water quality management procedures, evaluate production management strategies, and improve broodstock management programs. These factors directly influence production efficiency and farm profitability in the farm-raised catfish industry. The fiscal year 1986 grant will be awarded upon proposal acceptance, supporting this research through December 31, 1988.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986.

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1980–81, $150,000; FY 1982, $240,000; FY 1983–84, $270,000; FY 1985, $420,000; FY 1986, $418,000 or $400,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The grants have been awarded to the Mississippi Agricultural Experiment Station. All of this research is conducted at the Delta Branch Experiment Station, Stoneville, Mississippi.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Water quality studies at three stocking densities indicated that dissolved oxygen and unionized ammonia are the parameters most likely to limit production. Blood serum chemistry parameters have been characterized and the relationships of these parameters to water quality have been established. Feeds containing 25, 32, or 35 percent crude protein were evaluated with no significant differences in fish weight gain or food conversion, suggesting that the use of lower protein feeds may be more cost efficient. Least-cost diet formulation programs have been evaluated and can be applied to the industry. Feeding fish at different times of day did affect fat deposition. The effects of stocking densities and harvest schedules on growth rate, food conversion, percentage of harvestable fish, and fish community structure have been evaluated and can be manipulated to optimize production efficiency in continuous harvest systems. Plans call for fiscal year 1986 funds to be used to study different broodstock management procedures and feeding strategies. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of the studies proposed in the grants.

DAIRY AND BEEF PHOTOPERIOD, MICHIGAN

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Michigan State University scientists have determined that photoperiod duration has a positive effect on milk yield with no effect on milk fat content. Body weight gain was found to be associated positively with photoperiod durations for dairy cows and bulls; whereas beef steers did not respond the same as bulls or cows to length of daily photoperiod. The fiscal year 1986 grant proposal has been received. We are in the process of awarding the grant which will support research through October 1987.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1979, $242,500—Animal Health; FY 1980–81, $35,000; FY 1982–83, $34,000; FY 1984–86, $35,000 or $33,000 under Gramm-Rudman-Hollings in 1986.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at the Michigan State University.

Mr. WHITTEN. What has been accomplished to date, and what work remains to be done?

Dr. JORDAN. Abrupt changes from light to darkness or vice versa were found to be far less effective than gradual photoperiod changes in stimulating body growth of dairy bulls and cows. Evidence indicates that gonadal secretions are necessary for enhancement of body gain under the photoperiods studied. Thus, studies are planned to address this theory by quantitating specific hormones in the blood serum of male and female animals.

Research grants funded in fiscal year 1986 and prior years may be used over a period of up to 5 years for completion of the studies proposed in the grants.

AQUACULTURE RESEARCH

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. The primary objectives of this Special Research Grants program is to expand the scientific and technical base of the aquaculture industry. Included in the program are studies to improve production efficiency through fish nutrition, reproduction and breeding, disease and parasite control, and improved water quality. Under existing contracts this research has developed improved diet formulations, has greatly aided in the understanding, prevention, and control of fish diseases, has evaluated the use of hormones in controlling spawning, and has led to improvement in genetic stocks used in aquaculture. Research under grants awarded in fiscal year 1985 extends through September 30, 1988. The fiscal year 1986 deadline for submission of proposals was March 19, 1986. The proposals will be evaluated by peer panels and final selection of proposals is expected to be completed by June.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows FY 1981, $500,000; FY 1982–85, $518,000; FY 1986, $298,000 or $285,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. In fiscal year 1985 grants were awarded to Alabama, Georgia, Indiana, Mississippi, Oregon, Oklahoma, and Washington.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. These studies have provided valuable new knowledge related to diet formulations, disease diagnosis and control, improved reproduction efficiency, improvement in broodstock development and water quality. Proposals funded to date have dealt with problems that directly affect existing aquaculture systems. Research in fiscal year 1986 will include evaluation of the role of vitamins in disease resistance, improved methods for prevention and control of fish diseases, evaluation of hybridization and polyploidization on performance, comparison of hormones to induce ovulation and techniques for improved broodstock rearing. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of the studies in the grants.

GERMPLASM RESOURCES RESEARCH

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Special Research Grants provided for a portion of the program to insure an adequate reservoir of clonal fruit and nut germplasm resources needed by American agriculture. For fiscal year 1986 Special Research Grants will be used to support the clonal germplasm repositories at Davis, California; Corvallis, Oregon; Geneva, New York; and Riverside, California. Special Research Grants funds will provide for operating and staffing of the repositories. Grants for the repositories will be for a period of one year.

The repositories at Corvallis, Oregon; Davis, California; and Geneva, New York, are now fully operational. At Corvallis, the repository continues to add to its collection of germplasm. Work is continuing on heat treatments of pear germplasm to make this germplasm free of virus diseases. A new method has been devised to propagate pears that could lead to more effective elimination of virus diseases as well as the cryopreservation of pear germplasm. This new methodology is being used for raspberries and blueberries where it is possible to freeze and store meristems for future regeneration of plants. Field evaluations are in progress for each accession. Work is continuing on updating and enlarging the computer base for germplasm. At Davis, California, some of the greenhouses and screenhouses have been modified to enable better storage of germplasm accessions. Walnut germplasm has been collected. A more successful method has been devised for propagating pistachio which is difficult to propagate. New stone fruit germplasm is being heat treated to make certain it is free of viruses. A nursery for propagation of grapes by cuttings has been established. The repository now has more than 2300 grape accessions representing 42 species. Some germplasm has been distributed. Work is continuing on developing methodologies for maintaining germplasm *in vitro*. At Geneva, New York, apple and grape propagation continues. Work has started on indexing grapes and apples to make sure they do not have viruses. Plans have been made to identify other domestic collections of grape and apple germplasm that should be included

in the Geneva collections. Operations work at the Riverside repository was delayed until 1986 when ARS is scheduled to begin construction. Plans are being made to hire a curator and start acquiring and maintaining citrus and date germplasm.

Grants made in fiscal year 1985 to the Hawaii Agricultural Experiment Station for their new repository for tropical fruits and the Wisconsin Agricultural Experiment Station to continue evaluating the 1R-1 potato germplasm collection for serious pests of potatoes are not being continued in 1986 since ARS is providing agreed additional support, thus allowing CSRS to provide additional, needed support to the other repositories.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1981, $500,000; FY 1982-1984, $902,000; FY 1985, $1,000,000; FY 1986, $994,000 or $951,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. In fiscal year 1986 this research is being conducted at State Agricultural Experiment Stations located at Corvallis, Oregon; Davis, California; Geneva, New York; and Riverside, California.

Mr. WHITTEN. What has been accomplished to date and what remains to be done?

Dr. JORDAN. Funds for the Germplasm Special Research Grants have been used to operate and equip the clonal repositories at Geneva, New York for apples and Eastern grapes; Davis, California for stone fruits, grapes, walnuts, olives, figs and pistachio; Corvalis, Oregon for pears, small fruits, hazelnuts, and mint. In fiscal year 1985 small grants were made to begin operations at Waiakea, Hawaii for tropical fruits and Riverside, California for citrus and dates. Potato germplasm work has been conducted at Madison, Wisconsin to find resistance to the many diseases and insect pests of potatoes. Beginning in fiscal year 1986, ARS will fully support the potato work in Wisconsin and the repository at Waiakea, Hawaii thus allowing CSRS to provide more resources to the other repositories in the system. The nature of the clonal germplasm repositories requires acquisition evaluation, distribution and long-term maintenance and storage of clonal germplasm. Commitments over an extended period of time are essential.

Mr. WHITTEN. What is the estimated cost of completing this work?

Dr. JORDAN. Research proposed under the objectives of the current projects will be completed. No funds are proposed for fiscal year 1987 since the program is scheduled for transfer to the Agricultural Research Service.

PEACH TREE SHORT LIFE, SOUTH CAROLINA

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Research conducted under this grant has focused on resistance aspects. About 200 breeding lines were evaluated for susceptibility to ring nematode population increase. Ten percent of

this germplasm appears promising. New peach varieties, soil and orchard cover crop management and production economics models are being built on the fundamental findings in this project. Fiscal year 1986 special research grant funds have been made available; the award is pending receipt, review and approval of the proposal.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1981, $100,000; FY 1982-85, $192,000; FY 1986, $191,000 or $183,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at the South Carolina Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date, and what work remains to be done?

Dr. JORDAN. Fiscal year 1986 funds are being made available to the South Carolina Station for a new project on peach tree short life—PTSL. Chemical applications amount to $3-6 million annually on 30,000 acres of South Carolina orchards experiencing nematode problems. Therefore, the search for genetic resistance will be accelerated, with the potential benefit of $3-6 million savings in pesticide costs, in addition to reversing the losses directly due to PTSL damage. It is planned that all available *Prunus* germplasm can be screened over a 2-3 year period to determine the potential for developing resistance. Another thrust will search for a laboratory assay technique that would permit more rapid screening of germplasm. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of the research proposed in the grants.

BLUEBERRY SHOESTRING VIRUS, MICHIGAN

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Research dealt with movement and accumulation of Blueberry Shoestring Virus—BBSSV—in high-bush blueberry plants; genetics of resistance and screening for BBSSV resistance and tolerance; and, movement, development and chemical control of the aphid carrier of the virus. A new biotechnology tool known as dot-blot immunoassay has been developed to give a 4- to 10-fold increase in sensitivity of virus detection, permitting a more accurate means of following virus multiplication in blueberry tissues at earlier periods following infection. Since there is only limited resistance to BBSSV in commercial cultivars, the search for new improved resistance or tolerance to BBSSV has followed several paths. Native clones of blueberry have been screened and several currently have been found to be free of BBSSV. A long-term study was initiated to measure tolerance among the cultivars by various methods. Various crosses among commercial and wild blueberry genotypes were accelerated to increase the pool of genetic material available for determining the genetics of BBSSV resistance. An aphid development model is being developed in order to better define vulnerable stages for different control strategies, including

improved insecticides. The proposal for fiscal year 1986 funding has been received and is under review.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1981, $100,000; FY 1982–1986, $96,000 or $92,000 under Gramm-Rudman-Hollings in 1986.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted by the Michigan Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date, and what work remains to be done?

Dr. JORDAN. It was found that BBSSV is present at high levels in non-commercial fields and wild blueberry species. This finding makes it important for growers to remove these virus sources adjacent to commercial fields in order to minimize vulnerability of new cultivars and maximize success of new disease management strategies. Further study of spread of the aphid carrier of the virus showed that harvesting equipment can carry contaminated insects 32 meters down a row. It is therefore necessary that growers control the aphids before harvest to minimize virus disease spread. Insecticide tests showed that some materials repelled aphids from treated plants without killing them, increasing insect movement and potential for increased spread of virus. The new project will deal with further analyses of cultivars and wild type selections. Back crosses will be made among various genotypes to further characterize genetics of resistance and to isolate genes for improved resistance or tolerance. Testing of insecticides and other chemicals to control aphid populations or feeding behavior will be conducted. The aphid development model will be fine-tuned. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of the studies proposed in the grants.

MOSQUITO RESEARCH, RICELAND AGROECOSYSTEM

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. The goal of the Riceland Mosquito Management Program—RMMP—is to direct a coordinated, multi-institutional, multidisciplinary research effort toward gathering the scientific knowledge necessary to develop and implement Integrated Pest Management—IPM. The project has produced 77 technical articles, dissertations, and theses and has significantly impacted upon the development of several mosquito abatement projects in the southern rice growing region since its inception in 1980.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from $480,000 appropriated annually to CSRS in fiscal years 1982–1985 and $477,000 in fiscal year 1986 or $456,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research for the mosquito project is being carried out in Arkansas, California, Louisiana, Mississippi and Texas.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. During 1985, the diapause prediction model and other models were developed, which along with the supportive survey technology under development will be useful in better assessing and predicting the dynamics of target riceland mosquito populations and employing control strategies at time and in a manner that will be most effective in reducing mosquito related problems in the nation's riceland areas.

The results of the chemical pesticide tests completed in 1985 have assisted in identifying several mosquito adulticides and larvicides which have the potential of being used safely and effectively in riceland mosquito management programs. Tests involving BTI and methods for applying this bacterial toxin have made the environmentally safe agent a viable, economical option for mosquito control in riceland habitats. Tests involving *B. sphaericus*, fungal pathogens, predaceous arthropods and fish are aimed at the same ends as were the BTI tests.

As a result of implementing management strategies discovered by this project it is possible to demonstrate savings in the control of mosquitos of from $1.43 per acre in California to $4.26 per acre in Arkansas with greater reductions of mosquitos than with previously used methods.

Next year biology and behavior studies will continue, as will model testing. Management strategies to test adulticides and larvacides and studies on the use of pathogens and fish will continue. Application technology will also be pursued. A computer networking system is being developed for use by project participants and work on the development of expert systems for riceland mosquito management will be initiated. A bulletin on Riceland Mosquitoes and Their Management will be written. Research grants funded in fiscal years 1986 and prior years may be used over a period of up to five years for completion of the studies proposed in the grants.

TCK SMUT

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. A cooperative research program was conducted on TCK Smut of wheat involving the State Agricultural Experiment Stations in Idaho, Montana, Oregon, Utah and Washington. This effort continued the strong research collaboration in sharing techniques, data and germplasm among the five states. Research has focused on breeding, fungus germination, infection and host resistance mechanisms and TCK smut fungus detection. Breeding work has identified 12 new sources of TCK resistance, in which an original group of 10 known genes has been recombined, and the new combinations are helping to stay ahead of the fungus. Broadbased wheat variety development in the Northwest has been made possible by these funds, particularly critical in view of the withdrawal of federal efforts in variety development. Work in the area of fungus germination has resulted in determination of temperature

regimes that affect fungus spore dormancy, germination and survival in the soil, thus permitting prediction of fungus activity at various periods of the season. Fiscal year 1986 grants will be awarded to Idaho, Montana, Oregon, Utah, and Washington.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1982, $288,000; FY 1983-85, $361,000; FY 1986, $359,000 or $343,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at State Agricultural Experiment Stations in Idaho, Montana, Oregon, Utah, and Washington.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Infection processes were shown to be the same in juvenile plants, whether tolerant or susceptible to the disease. It was found, however, that in maturing plants, TCK-tolerant genotypes have a different triggering mechanism than susceptible genotypes, permitting tolerant plants to outgrow or even inhibit further fungus damage. Fungus mutants have been identified, providing material for segregating pathogenic from non-pathogenic types. Work on fungus detection has resulted in development of a monoclonal antibody technique which allows detection of one spore in several pounds of grain, and spore morphology and fluorescence information that permits a rapid, initial screen for TCK smut presence. With this year's funding, management studies will increase emphasis on minimum tillage in comparison to other practices. No fungicide work has been done, so the use of fungicides for soil fumigation or control of plant infection will be explored. Conventional germplasm and embryo culture hybridization work will continue. Increased biological control strategies such as soil competitors or antagonists, and physiological and hormone triggers that limit infection or disrupt the fungus life cycle will be investigated. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of the studies proposed in the grants.

SUNFLOWER INSECTS, NORTH DAKOTA AND SOUTH DAKOTA

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Research on sunflower insects at North Dakota has been focused on three principal areas; relation of planting dates and sunflower insect damage, resistance of sunflower cultivars to insects, and the use of insecticides to reduce sunflower damage by insects. South Dakota will receive initial funding in FY 1986.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

Dr. JORDAN. This research has been underway in North Dakota since fiscal year 1982. In fiscal years 1982 and 1983, $72,000 and $80,000 were appropriated for research on sunflower midge. In fiscal years 1984 and 1985, $150,000 was appropriated for research

on sunflower insects. In fiscal year 1986, $199,000 has been appropriated or $190,000 under Gramm-Rudman-Hollings. Fiscal year 1986 is the first appropriation for South Dakota who will receive 25% of the sunflower insects appropriation.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being carried out at the North Dakota and South Dakota Agricultural Experiment Stations.

Mr. WHITTEN. What has been accomplished to date, and what work remains to be done?

Dr. JORDAN. In the research on the relation of planting dates and sunflower insect damage, North Dakota has determined that early-planted sunflowers have significantly less damage by seed weevils than late planted sunflowers. However, early-planted sunflowers sustained more damage by stem weevil than late-planted sunflowers. No significant differences were detected in oil content and achene weight for early- and late-planted sunflowers. In the research on resistance of sunflower cultivars to insects, North Dakota has evaluated 22 sunflower accessions for resistance to seed weevil. Damage ranged from 1% to 15% achene damage. Sunflower damage related to flowering date and achene hardness. Tight bracts inhibited oviposition by sunflower midge. Sunflower hybrid 212 is susceptible to sunflower midge damage; 894 is moderately susceptible, and 315 is tolerant to damage by sunflower midge. In the research on the use of insecticides to reduce sunflower damage by insects, North Dakota has determined that the insecticide resmethrin applied to sunflowers reduced damage by the seed weevil to 3% versus 45% damage for untreated sunflower. Insecticides applied at the onset of seed development increased the effectiveness of the insecticide by 14% over insecticides applied at late seed development. Carbofuran applied at planting time reduced the mean number of sunflower stem weevil larvae from 81% infestations to 17% infestations. A mixture of methyl and ethyl parathion was effective in reducing populations of *Cynthia cardui*, the painted lady butterfly, which is a sporatic migrant pest from the South. Adult populations in sunflowers were reduced by mowing weedy field margins throughout the adult flight and oviposition period. Research in FY 86 in North Dakota will continue investigations on planting date research, insecticide evaluations, and will expand research on host plant resistance. Additional varieties will be evaluated for insect resistance, and host plant-insect chemical interactions that attract or repel insects to the sunflower plant will be pursued in detail. South Dakota will initiate research on the use of somatic cell and embryo culture techniques for enhancement of sunflower germplasm. North and South Dakota will coordinate their research programs. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of the studies proposed in the grants.

TROPICAL AND SUBTROPICAL RESEARCH

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. This program is being operated with the planning and coordination of the Pacific Basin Advisory Group—PBAG and the Caribbean Basin Advisory Group—CBAG. State Agricultural Experiment Stations that are members of PBAG are Hawaii and Guam; members of the CBAG are Florida, Puerto Rico and the Virgin Islands. Funds for the program are being divided equally between the two Basin Advisory Groups. Work is being conducted to improve the agriculture of the tropical and subtropical parts of the United States. Special Research Grants have been awarded for research on determining the land and water resouces need for better agricultural production, improving crop and animal production by reducing pest losses, better productivity practices and improved storage and shipping of crops. The fiscal year 1986 grants are in the process of being awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

Dr. JORDAN. The operation of the tropical and subtropical research program was transferred from ARS to CSRS, with CSRS funding being first provided in fiscal year 1983. Funds in the amount of $2,980,000 were appropriated in fiscal years 1983 and 1984. In fiscal year 1985 $3,250,000 was appropriated. In fiscal year 1986, $3,231,000 was appropriated or $3,091,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted in Florida, Louisiana, Puerto Rico, Virgin Islands, Hawaii and Guam.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. In fiscal year 1985 a total of eighty-eight grants were awarded. Grants were awarded for research mainly in areas of crop and animal productivity and protection; land and water resources needed for agricultural productivity; and postharvest physiology of crops. Research being conducted includes work on viruses of forage legumes, migratory insect pests, sugarcane disease and insect pests, control of citrus blight, coconut pests, finding rice germplasm resistant to insect pests, controlling nematode pests of tropical vegetables, production of aroids, irrigation needs and water use of tropical crops, virus diseases of bananas, postharvest physiology of tropical fruit and vegetable crops, developing virus resistant papayas, potential of vegetable seeding transplants, medfly control, use of growth regulators to promote production of winged bean, use of sap analysis to guide fertilization of tropical vegetables, predictions of crop performance from climate and growth relationships, response of tropical crops to mycorrhizal fungi and rancidity of tropical nuts and oils. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of studies proposed in the grants.

DAIRY GOAT RESEARCH

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. The work to date has concentrated on nutrition, reproduction, breeding, and management of goats. Nutritional and

management regimens for milk production and for weaning goats were published. Optimum weaning weight and age and also the induction of estrus for out of normal breeding season in female goats have been investigated. The fiscal year 1986 grant has been received and presently is being processed through the USDA evaluation system. The proposed grant award will support this research throught January 1988.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

Dr. JORDAN. These grants were initiated in fiscal year 1983 and $100,000 has been appropiated for fiscal years 1983–1985 and $99,000 for fiscal year 1986 or $95,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at Prairie View A&M, Texas.

Mr. WHITTEN. What has been accomplished to date, and what work remains to be done?

Dr. JORDAN. The results of the research on various management aspects of young and adult goats have been communicated to the goat industry through news releases, field days, and other research reports. Work continues on semen production, semen processing, and synchronization of estrus. Additional research will test the hypothesis that the transfer of heterologous genes to the goat genome will result in superior offspring more resistant to viral diseases, and which passes enhanced production traits with the ability to transmit these desirable traits to future generations.

Research funded in fiscal year 1986 and prior years may be used over a period up to 5 years completion of the studies proposed in the grant.

SUGARLAND USE RESEARCH, HAWAII

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Alternative crops need to be found for sugar, Hawaii's largest crop. Since 1980, the Hawaii sugar acreage has decreased fourteen per cent. Research is progressing well according to the objectives of the Special Research Grant which are to develop a computerized data base containing soil, crop, climate, and economic information; develop methodology for screening alternative crops based on economic criteria; and to develop crop yield models for extrapolating input and yield data from one location to another. The fiscal year 1986 grant has been solicited.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

This research has been underway since fiscal year 1983; $150,000 was appropriated in fiscal years 1983–1985, and $149,000 in fiscal year 1986 or $142,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted by the Hawaii Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Research, to date, has shown that the natural land data base is almost complete. It provides detailed land, soil, and environmental data for the state in twenty acre sections. The economic screening methodology has been determined and is being tested on several crops to validate the yield prediction model. After this methodology is proven then the 1,100 potential crops for Hawaii can be screened to thirty or less crops for which actual field production testing would be needed. This new methodology will allow industry representatives and other decision makers to vary growing conditions and assumptions, thus reducing drastically the number of alternative crops and growing locations needed for time consuming and sometimes expensive field testing. Research grants funded in fiscal year 1986 and prior years may be used over a period of five years for completion of the studies proposed in the grant.

Mr. WHITTEN. What is the estimated cost of completing this work?

Dr. JORDAN. In 1982 the Hawaii State Agricultural Experiment Station developed a proposal for the use of agriculture land in Hawaii that would take five years to complete and would require $150,000 funding each year. Research proposed under the objectives of the current projects will be completed. As the results of this research become known, an assessment can be made of the need for augmenting the base of scientific knowledge developed by this program.

INTEGRATED PRODUCTION SYSTEMS, OKLAHOMA

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. An orchard/vegetable and orchard/small fruit intercropping systems for small farms in Southeastern Oklahoma has been developed. This has included a study of the impact of alternative orchard and vegetable and strawberry intercropping systems on farm income, income variability, short-run and long-run cash flow, resource requirements, and the optimal use of farm family resources. The FY 1986 grant proposal has been received and is in the process of being awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1984, $200,000; FY 1985, $250,000; FY 1986, $249,000 or $238,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at the Oklahoma State Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. This research has resulted in the development of peach orchard/vegetable and peach orchard/small fruit intercropping recommendations for selected small fruit and vegetable crops adapted to an intercropping system in Southeastern Oklahoma. Re-

search grants funded in FY 1986 and prior years may be used over a period of up to five years for completion of the studies in the grants.

PRESERVATION AND PROCESSING RESEARCH, OKLAHOMA

Mr. WHITTEN. Fully describe the work that has been done under this program and the period of the existing contract.

Dr. JORDAN. This research project was developed to study the current structure of the vegetable processing industry in the South Central region of the U.S. and to determine whether the existing processing plants are planning to make changes in their processing capacity. The project incorporates the best product mixes for different types of processing plants and the cost per unit the processing plants can pay farmers for their vegetables to enable the farmers to make a profit. The FY 1986 grant proposal has been received and is in the process of being awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1985, $100,000; FY 1986, $149,000 or $142,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This work is being conducted at the Oklahoma State Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date and what needs to be done?

Dr. JORDAN. This work has resulted in the identification of a group of small, low income farmers who have an interest in producing vegetable and fruit crops for the processing industry, including freezing, canning, and irradiation. The research grants funded in FY 1985 and FY 1986 may be used over a period of up to five years for completion of the studies proposed in the grant.

POTATO RESEARCH

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Scientists at selected State Agricultural Experiment Stations in the Eastern, Western, and Midwestern U.S. are developing new disease resistant, russet skin potato varieties which can be grown for profit and which will fit the needs of both industry and the fresh market. Studies have been conducted in such areas as: protoplast regeneration, somoclonal variation of leaf disks and protoplasts; phosphofructose changes and sweetening capacity of potatoes stored at low temperatures; production of quality potato germplasm; improved propagation and evaluation procedures; and potato storage research over an extended season. The FY 1986 grant proposals have been received and are in the process of being awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1983, $200,000; FY 1984, $400,000, FY 1985, $600,000; FY 1986, $795,000 or $761,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The research work is being conducted by the State Agricultural Experiment Stations in Maine, Maryland, New York, Pennsylvania, Idaho, Oregon, Washington, Michigan, and North Dakota.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. This research has resulted in several new, high quality, disease resistant, high yielding potato cultivars which are of high commercial value to the processing and fresh market industries. Research grants funded in FY 1986 and prior years may be used over a period of up to five years for completion of the studies proposed in the grants.

ASPARAGUS YIELD DECLINE, MICHIGAN

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Two related viruses and a fungus disease known as *Fusarium* root and crown rot, are primary pathogens implicated in the decline. Laboratory and field studies indicate that the virus infections increase susceptibility to root and crown rot. Environmental stress research in progress implicates moisture stress and soil acidity as having an impact, but that temperature does not have an impact on yield decline. Initial studies show that chemicals present in asparagus residue move into the soil and predispose the subsequent crop to *Fusarium* root and crown rot. Current research indicates that the genetic base of this specific asparagus pathogen is very broad. This explains why there is virtually no commercial asparagus germplasm with resistance or even tolerance to the fungus. Overseas exploration in areas of the Mediterranean region where asparagus originated has resulted in collection of a wide variety of asparagus and related species. These materials are being prepared for various screening tests. The proposal for fiscal year 1986 funding has been received and is under review.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

Dr. JORDAN. This grant was initiated in FY 1984 and $100,000 has been appropriated in fiscal years 1984-85 and $99,000 in fiscal year 1986 or $95,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the Michigan Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. It was found that biotypes of the fungus exist in areas never planted to asparagus, but having specific pathogenicity for the plant. The wide genetic base of the pathogen is therefore indicated and various genetic studies are being pursued to explain the reason for occurrence of these biotypes. Under this year's grant funding, a field planting of asparagus, in which virus-infected and

healthy plants were located, will be monitored to determine whether virus interactions or environmental factors impact on plant survival. Allelopathic compounds in asparagus residue will be identified, with the objective of evaluating their use as indicators of site vulnerability to root and crown rot. Soil pH, moisture level and nutritional status will be studied to determine specific interactions that impact on the incidence and severity of root and crown rot. Domestic and foreign asparagus germplasm will be used in development of somatic embryos in tissue culture. The focus of new research will be in methods to identify and isolate genetic material with superior resistance or tolerance to yield decline agents. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of the studies proposed in the grants.

BIOCONTROL OF GRASSHOPPERS, KANSAS

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Research on the biological control of grasshoppers focuses on the utilization of the fungus *Entomophaga grylli*. The objectives are to achieve an understanding of the potency of artificially applied fungal spores-conidia, and establish the influence of humidity on disease formation on hosts.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1984–1986, $50,000 or $48,000 under Gramm-Rudman-Hollings in 1986.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The research is being carried out at the Kansas Agricultural Experiment Station. The research complements ARS funded studies in North Dakota, South Dakota, Idaho, and New York where environmental aspects of the host-pathogen system are related to regional conditions. The Kansas study represents the lower rangeland region.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Initial research investigations determined that the contagious entity of the infestive fungus of grasshoppers, *Entomophaga grylli* is the germ conidium. The manuscript describing this research has been published. Beyond the initial descriptions of the infection process, two principal discoveries have been made: First, it has been discovered that the fungus invades only the grasshopper fat bodies. Although the fungus does not invade other tissues, it may grow around these tissues depriving them of nutrients. Also the fungus exists only as pleomorphic protoplasts while the grasshopper is alive. These findings relate directly to the potential of the fungus for management of grasshopper populations and for the synthetic fermentation and commercial production of the fungus. The requirements for *in vitro* production of the fungus are drastically different from what had been expected; and the fact that only protoplasts are formed within the live insect changes the hypothesis concerning the overall life cycle of the pathogen. The second sig-

nificant finding relates to sublethal and prelethal effects of the fungus on the grasshopper. Grasshoppers do not become "sick" as a result of the fungal infection prior to their death. Behaviorally, the infected insects are either dead or act as normal, healthy insects. More importantly, during the course of an *Entomophaga* infection the infected insect is neither more prone to predation nor less prone to devour plant material than a healthy insect. A grasshopper infected by *Entomophaga* is just as damaging to its host plant as a healthy grasshopper. We now know from a management perspective *Entomophaga* will not be important in reducing damage by grasshoppers in the immediate generation, but will be very important in the reduction of individuals for the next generation. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of the studies proposed in the grant.

WOOL RESEARCH, TEXAS

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Scientists are conducting research on wool and mohair to enhance selection of animals; to determine the effects of management, nutrition, and health related treatments on fiber quality and quantity; to develop rapid, objective evaluation of wool and mohair; and to further develop technologies to evaluate scouring and effluent treatment of scouring liquors. The fiscal year 1986 grant proposal has been received and we are in the process of awarding the grant which will support this research through August 1987.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1984–1985, $150,000; FY 1986, $149,000 or $142,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at the Texas Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date, and what work remains to be done?

Dr. JORDAN. The physical facility for wool and mohair research has been completed. Most of the equipment has been installed. Scientific and support staff are in place. Research is underway on the items enumerated above. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to 5 years for completion of the studies proposed in the grant.

AGRICULTURAL POLICY INSTITUTE, IOWA AND MISSOURI

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contracts.

Dr. JORDAN. The grants support the continued development and use of agricultural policy and trade modeling capabilities at the University of Missouri and Iowa State University. These analytical capabilities continue to be utilized to evaluate the near and longer

term implications of possible alternative farm, food and trade programs and to assess the impacts of changing economic conditions in agriculture and its markets. Grants will cover a period of one year. The fiscal year 1986 grant proposals are in the process of preparation and will be received soon.

Mr. WHITTEN. How long has the work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1984–1985, $450,000; FY 1986, $373,000 or $357,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is the work being carried out?

Dr. JORDAN. The research is being conducted at the Food and Agriculture Policy Institute at the University of Missouri and the Center for Trade and Agricultural Policy at Iowa State University.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. The University of Missouri is focusing on U.S. domestic farm and food policies and their domestic impacts. Iowa State University is focusing on the economic interrelationships between domestic and foreign food and agricultural industries and evaluating factors in the U.S. and abroad that influence trade prospects and patterns. Most major options proposed in advance of passage of the 1985 Farm Bill were analyzed. Impacts of the farm financial situation were estimated. Trade models for feed grains, soybeans and wheat were developed and assessments were made of trade liberalization and inflationary impacts. Analyses conducted at these centers are being presented in reports, conferences and proceedings that are of interest to all who are involved in the development of U.S. agricultural policy. Research grants funded in fiscal year 1986 and prior years may be used over a period of up to five years for completion of studies proposed in the grants.

BIOMASS FROM DAIRY PROCESSING WASTE, MISSOURI

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Blended effluents from dairy processing plants, after undergoing oxidation, are referred to as dairy processing sludge or biomass. This biomass is being evaluated for its potential as a feed ingredient or as a fertilizer. The fiscal year 1986 grant has been awarded, supporting this research through March 31, 1987.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1985, $300,000; FY 1986, $298,000 or $285,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This work is being conducted at the Missouri Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date, and what work remains to be done?

Dr. JORDAN. In 1985, feeding trials were initiated utilizing from 6 to 20 percent of biomass in pig and sheep diets. Analysis of samples

over an extended period revealed from 30–40 percent ash and a high content of single-cell protein. No inorganic or organic pollutants were found. In 1986, the effect of feeding biomass to reproducing females over multiple generations will be initiated with simultaneous observation of offspring.

In field tests as a fertilizer, biomass appeared to have economic value when applied to land in proximity to the processing plant, especially on acid soils. Further study is needed to appraise the variability in the biomass from different plants and as affected by different processing methods. Value as a fertilizer will be related to transportation costs and must be equated to the price of commercial fertilizer, type of soil, stage of plant growth and other agronomic factors. The research grants funded in fiscal years 1985 and 1986 may be used over a period of up to five years for completion of the studies proposed in the grant.

STONE FRUIT DECLINE, MICHIGAN

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Special Research Grant funds have supported an interdisciplinary team of 12 scientists in efforts to determine the principle agents of decline in peach, sweet cherry and tart cherry. A mycoplasma agent "cause of 'X-disease' ", *Cytospora* canker and cold hardiness appear to be the major decline factors in peaches. Progress has been made in developing a biotechnology tool, known as monoclonal antibody, as a probe to determine mycoplasma presence in alternate plant hosts of X-disease. *Cytospora* fungus isolates are being screened, with the goal of finding a weakened or hypro-virulent strain that could be used to transfer reduced pathogenicity to orchard populations of the fungus. Research on cherries is also concerned with "X-disease", in addition to root problems associated with soil fungi and soil permeability. Two pathogenic fungi have been found in declining cherry orchards with poorly drained soils. Fiscal year 1986 funds have been made available to the Michigan Station, and the award is pending receipt, review and approval of the research proposal.

Mr. WHITTEN. How long has this work been underway and how much had been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1985, $300,000; FY 1986, $298,000 or $285,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the Michigan Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date, and what work remains to be done?

Dr. JORDAN. Some success has been achieved in finding peach genotypes that come to full production earlier, thus minimizing the impacts of older orchard tree production loss due to the decline complex. The majority of tart cherries are shaker-harvested, and mechanical damage to tree trunks is widespread. These wounds provide entry for microbes and insect borers. Clamp design changes have been developed and recommendations to growers will be made

in the near future. Cold injury also affects the health and longevity of sweet and tart cherry trees. Seedlings are being screened for improved hardiness and acclimatization qualities. Fiscal year 1986 grant funds will continue development of the monoclonal anitbody probe for detecting X-disease in peach, cherry and other possible host plant species. Protoplast fusion technology will be applied to research on transfer of the pathogenicity attenuation factor to orchard population of the *Cytospora* fungus. Orchard ground cover plants will be tested for ability to penetrate orchard soil hardpans, improving soil drainage. Pheromone borer attractants will be investigated as a means to monitor insect life cycles for optional insecticide application strategies. Peach and cherry cold injury damage thresholds will be determined. Broad-scope screening will be conducted with cherry germplasm for genetic resistance or tolerance to diseases, winter hardiness and other orchard management-oriented attributes. The research grants funded in fiscal years 1985 and 1986 may be used over a period of up to five years for completion of the studies proposed in the grant.

Mr. WHITTEN. What is the estimated cost of completing this work?

Dr. JORDAN. A proposal for research on factors causing the decline of cherry and peach trees and production in the North Eastern United States was prepared by representatives of the cherry and peach industry and the Michigan Agricultural Experiment Station, dated July, 1982. The proposal provided for research over a period of five years and requested Federal funds of $2,290,052.

EDB REPLACEMENT, HAWAII

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. This project was initiated in fiscal year 1985. The fiscal year 1986 proposal is currently in the process of being awarded. Development of alternative mechanisms by which papaya fruits will meet quarantine requirements for export is the goal of this project.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1985, $300,000; FY 1986, $298,000 or $285,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is the work being carried out?

Dr. JORDAN. This research is being conducted at the Hawaii Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Scientists at the Hawaii Agricultural Experiment Station have been examining various mechanisms to disinfest papayas of fruit flies, prevent infestation by fruit flies, assure fruit quality and shelf life in the market place, and control postharvest diseases. In addition they are developing means to assess the quantity and causes of fruit losses during postharvest handling, transportation, marketing and consumption. Information transfer is playing an important role in this project and assures the adoption

of improved practices as well as research efficiency. The research grants funded in fiscal years 1985 and 1986 may be used over a period of up to five years for completion of studies proposed in the grant.

INTEGRATED REPRODUCTION MANAGEMENT, NEBRASKA

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Research is in progress to evaluate management procedures and traits which influence reproductive efficiency in beef cattle and develop on-farm short-term procedures in swine seed stock herds for estimating breeding value of economically important traits. This project is the application of an Integrated Reproduction Management—IRM—problem-solving concept in which there is an integration of research, extension and resident instruction in solving complex food animal reproduction problems. The fiscal year 1986 grants will support work through September 1987.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1985, $100,000; FY 1986, $99,000 or $95,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This work is being conducted at the Nebraska Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. In 1985, to measure the effect of heterosis on age at puberty and conception, these traits were observed in 300 heifers representing five different lines and crosses. Similar observations will be made in 1986. Modeling, verified by on-ranch observations, is also being used to determine the effect of seasoned time of breeding on economic efficiency related to different reproductive traits in cattle.

In 1986, a number of alternative programs designed to rapidly estimate the breeding value of swine seed stock will be compared. Research grants funded in fiscal years 1985 and 1986 may be used over a period of up to five years for completion of the studies proposed in the grants.

CRANBERRY-BLUEBERRY DISEASE AND BREEDING, NEW JERSEY

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Techniques were developed to determine whether fungi in blueberry roots are associated with the Sheep Pen Hill disease. Stem tissue from plants showing blight and dieback have lower calcium and magnesium concentrations than in healthy plants. Red Ringspot virus disease is the major cranberry disease under study. A search is underway to identify the vector of the virus. Serological methods were explored for use in specific detection of the virus in the host plant and in insect candidates as vectors, and to date this approach has not been successful. The re-

search proposal for fiscal year 1986 funding has been received and is under review.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1985, $100,000; FY 1986, $99,000 or $95,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the New Jersey Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Greenhouse blueberry seedlings grafted with buds from bushes in the field infected with the Sheep Pen Hill disease have not shown the Spring Blight phase, but have shown the fall line pattern Fall Symptom phase. Greenhouse rooted cuttings taken from field-infected plants likewise have shown only the fall line pattern symptoms, and the mortality rate in these cuttings is much higher than in apparently healthy cuttings. Electron microscope studies were begun on tissues from bushes in the field showing the Spring Blight phase of the disease. Flexuous rod, virus-like particles were found in all plants with symptoms and in only one plant without obvious symptoms. Fiscal year 1986 grant funds will support research on the Sheep Pen Hill disease to determine why greenhouse budded seedlings and rooted cuttings do not show the Spring Blight symptoms. Field environmental conditions will be monitored to determine whether certain stresses influence the disease. Nutritional studies will be conducted to determine what roles calcium and magnesium may play. A more comprehensive state survey will be conducted to determine how widespread the disease is in New Jersey. Serological techniques will be further tested for specificity in virus detection. Attempts will be made to purify the virus-like agent implicated in Sheep Pen Hill disease of blueberry. Cooperative research with Michigan State University will focus on serological methods for detecting the Red Ringspot virus in cranberry plants and in insects. Research grants funded in fiscal years 1985 and 1986 may be used over a period of up to five years for completion of the studies proposed in the grant.

ALTERNATIVE CROPPING SYSTEMS IN THE SOUTHEAST

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. The South Carolina, North Carolina, and Georgia State Agricultural Experiment Stations have developed a cooperative project to: identify the horticultural commodities which have the most potential for expansion in the Carolinas and Georgia; study the seasonal succession of vegetable crops by using varying planting dates and varieties to lengthen the potential marketing season; develop improved cultural practices for more efficient production of horticultural crops in the Southeast by making optimal use of land and water resources; and evaluate alternative markets

for new and expanded production of selected horticultural products. The FY 1986 grant proposal has been received and is in the process of being awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1985, $300,000; FY 1986, $298,000 or $285,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This work is being conducted at the South Carolina, North Carolina, and Georgia State Agricultural Experiment Stations.

Mr. WHITTEN. What has been accomplished to date and what works remains to be done?

Dr. JORDAN. This research has resulted in the identification of "market windows", where specific horticultural crops can be sold for a profit, and the development of improved production practices for competitively producing vegetable crops in the tristate area. The research grants funded in FY 1985 and FY 1986 may be used over a period of up to five years on completion of studies proposed in the grants.

MAPLE RESEARCH, VERMONT

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Over the last several years maple trees in Vermont and the surrounding regions have apparently been undergoing environmental stress. Research begun last year in the project entitled "Water Stress Physiology of Maple Trees" is designed to gain a better understanding of the movement of water in maple trees. The University of Vermont has been acquiring highly sophisticated apparatus in preparation for conducting studies of xylem vulnerability experiments on maple stems. Work has progressed on new methods for analyzing the flow of water through maple trees. A new grant proposal extending this research has been received and is in the process of being awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1985, $100,000; FY 1986, $99,000 or $95,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the Vermont Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. During the winter of 1985/86 new experimental equipment was acquired and assembled for analysis of water flow through maple trees and testing of this apparatus has begun.

During the early summer of 1986, vulnerability measurements on roots and stems using summer wood will be carried out to deter-

mine differences due to tissue dormancy. Seasonal changes in stem density and hydraulic conductance will be monitored.

This research is truly basic, or fundamental. However, it is essential to gain this level of understanding for advancing practical applications. It is expected that some of the problems encountered with maple trees will be traceable to water physiology. Research grants funded in fiscal years 1985 and 1986 may be used over a period of up to five years for completion of the studies proposed in the grant.

WOOD UTILIZATION RESEARCH

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Research programs were initiated by the forestry research units of the four institutions involved in the program: Michigan State University, Mississippi State University, Oregon State University and Purdue University. All programs were reviewed and approved by a panel of experts made up of federal government or university scientists. Since much of this research is forestry based, the time elements are long term. Much of the research is to be conducted over the next two to four years.

One completed study prioritized those research needs into developing economically viable harvesting technologies for southern timber that would reduce or eliminate environmental insults. That study is to be the subject of a seminar to be held in mid April 1986. All of the other studies are in the formulation or data gathering stage.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

[The information follows:]

Grants have been awarded from funds appropriated as follows: FY 1985, $3,000,000; FY 1986, $2,982,000 or $2,852,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The principal investigators for this research are located at Michigan State University, Mississippi State University, Oregon State University and Purdue University. The major portions of the research are being conducted within the Colleges and Departments of Forest Science at these institutions. Other portions have been subcontracted to Departments of Engineering at Purdue University and College of Forestry at Auburn University.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. The nature of this research dealing with the various aspects of Wood Utilization requires that it be conducted over a long period. The research programs are to examine economically profitable means to harvest and transport wood; to manufacture and process timber, to manufacture wood composites, to provide better and less expensive structures made from wood, to explore wood chemistry, to protect and preserve wood and to evaluate the economics and marketing of timber products. As these research projects determine results, the transfer of these emerging technologies is to be undertaken. Most research programs in this grant have been underway less than a year from the inception of this

grant. Research grants funded in fiscal years 1985 and 1986 may be used over a period of up to five years for completion of studies proposed in the grants.

APPLE QUALITY RESEARCH, MICHIGAN

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. This is a new program in FY 1986. It has been developed to permit research on apple handling, storage, and transportation procedures so that Michigan apple growers, who produce high quality apples, can compete effectively in the marketplace with apple growers in the West and the Northeast. The 1986 grant proposal has been received and is in the process of being awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

Dr. JORDAN. This research is being initiated in FY 1986 and $99,000 has been appropriated or $95,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is the work being carried out?

Dr. JORDAN. This work is being conducted at the Michigan Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Research is being initiated in FY 1986 on handling, storage, and transportation procedures so that high quality Michigan produced apples can reach the marketplace and compete effectively with apples produced in the West and the Northeast. The research grant funded in fiscal year 1986 may be used over a period of up to five years for completion of the studies proposed in the grant.

AQUACULTURE PLANNING GRANT, HAWAII

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Meetings to determine the objectives and procedures for this planning grant are now taking place. The current status of aquaculture in Hawaii will be carefully examined including recommended areas for further development. The potential and present status of important aquaculture species will be determined. Aquaculture expansion in U.S. Pacific territories will be examined to define tropical aquaculture for Hawaii as well as the Pacific area. A complete literature survey will be conducted including the potential of marine biotechnology as applied to aquaculture. The grant will be awarded upon proposal acceptance, supporting this research through December 31, 1988.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

Dr. JORDAN. This research is being initiated in fiscal year 1986. A total of $149,000 has been appropriated or $142,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research will be coordinated by the University of Hawaii College of Tropical Agriculture and Human Resources

through the "Ad hoc Aquaculture Group" consisting of the Hawaii Institute of Marine Biology, The University of Hawaii Sea Grant College Program, The Aquaculture Development Program of the State Department of Land and Natural Resources and the Oceanic Institute.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Research is being initiated in fiscal year 1986. Preliminary discussions are being held to outline and determine the scope of the program and the responsibilities of each participating institution. Preparation of the program proposal is underway. The research grant funded in fiscal year 1986 may be used over a period of up to five years for completion of the studies proposed in the grant.

FRUIT AND VEGETABLE PRODUCTION AND MARKETING, KENTUCKY

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Since many small farmers in Kentucky who are dependent on tobacco for their main source of cash income are facing serious problems with this crop, the need for alternative cash crops is critical. Farm income from tobacco could be supplemented by vegetables in the near future and fruit crops later since they take longer to grow. However, the farmers are going to need advice and assistance on how to grow high yielding, high quality vegetable crops and how to market these crops profitably. The fiscal year 1986 grant has been solicited.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986.

Dr. JORDAN. This research is being initiated in fiscal year 1986 and $149,000 has been appropriated or $142,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the Kentucky Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Research is being initiated in fiscal year 1986. Objectives of this research will be to determine productive vegetable crops with good marketing potential; identify present cropping and livestock production systems that would complement the growing of horticultural crops; develop efficient horticultural production systems; and develop efficient marketing systems. The research grant funded in fiscal year 1986 may be used over a period of up to five years for completion of the studies in the grant.

PLANT STRESS

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Although research under this program will be initiated in fiscal year 1986, considerable work has been done in the southwestern U.S. on improving arid and semi-arid land agriculture. Results from this work provide the background and rationale

for the objectives to be achieved in the new program and indicate the need for a more coordinated program of research. The fiscal year 1986 grant proposal has been received and is in the process of being awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

Dr. JORDAN. This research is being initiated in fiscal year 1986 and $298,000 has been appropriated or $285,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research will be conducted by a consortium of institutions comprised of New Mexico State University, Los Alamos National Laboratory, Texas Tech University, University of Arizona, and the University of California at Riverside. New Mexico State University is the lead institution.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Research on the objectives of this program will be initiated in fiscal year 1986. In preparation for this, preliminary plans have been made for assembling interdisciplinary research teams, development of a catalog of researchers and projects, sponsorship of a symposium, identification of a peer review committee for data interpretation, and dissemination of research results. The research grant funded in fiscal year 1986 may be used over a period of up to five years for completion of the studies proposed in the grant.

MILK CONSUMPTION, PENNSYLVANIA

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Research work on this project is scheduled to begin on May 1, 1986, and be completed by May 31, 1988. The investigators plan to identify those segments of the adult population who could be influenced to increase their consumption of dairy products and to determine consumer reaction to recent generic dairy product promotions. In addition, these investigators plan to determine consumer awareness and acceptance of imported dairy products.

In the health area another team of scientists will determine the structure and anticancer potential of an inhibitor of cholesterol biosynthesis in milk which suppresses the cholesterol biosynthetic mechanism at an enzyme locus which circumvents cancer cell adoption.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

Dr. JORDAN. This research is being initiated in fiscal year 1986 and $298,000 has been appropriated or $285,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at Pennsylvania State University.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. A project outline has been submitted which describes the work to be done beginning in fiscal year 1986 and how the investigators plan to conduct these investigations. The research grant funded in fiscal year 1986 may be used over a period of up to five years for completion of the studies proposed in the grant.

INTERNATIONAL LIVESTOCK PROGRAM, KANSAS

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. The purpose of this program is to aid producers in the marketing of livestock, livestock products, and commodities utilized by livestock. In addition, scientists plan to provide training, education and technical assistance to people desiring to export livestock and/or livestock products. The technical program will cover all farm animal species. The fiscal year 1986 grant proposal has been received and we are in the process of evaluating the grant.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

Dr. JORDAN. This research is being initiated in fiscal year 1986 and $99,000 has been appropriated or $95,000 under Gramm-Rudman-Hollings?

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at Kansas State University.

Mr. WHITTEN. What has been accomplished to date, and what work remains to be done?

Dr. JORDAN. Research is being initiated in fiscal year 1986. This research should encourage U.S. livestock producers in their desire to export livestock, livestock products and related commodities and could lead to better methods for meeting the competition from other exporting countries.

The research grant funded in fiscal year 1986 may be used over a period of up to five years for completion of the studies proposed in the grant.

STORED GRAIN INSECTS, KANSAS

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. Initial application for funding has been received. The project proposes to: identify and evaluate current grain storage practices and their relationship to grain quality and insect infestation; develop and evaluate methods for early detection of insect infestations and for estimation of quantity and quality losses so that economic thresholds can be estimated; evaluate promising alternative non-chemical means for insect prevention and/or control; develop ongoing programs to monitor the effectiveness of insect control methods and materials and determine the economic impact of different stored-grain management strategies.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

Dr. JORDAN. This research is being initiated in fiscal year 1986 and $298,000 has been appropriated or $285,000 under Gramm-Rudman-Hollings.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at Kansas State University.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. Research is being initiated in fiscal year 1986. A research project addressing the above objectives has been received and is being processed for funding. The research grant funded in fiscal year 1986 may be used over a period of up to five years for completion of the studies proposed in the grant.

FORT STANTON EXPERIMENT STATION RELOCATION, NEW MEXICO

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. The planning of the relocation is proceeding. The Sierra Blanca Airport Commission accepted the deed and the terms of the exchange on January 29, 1986. New Mexico State University is in the process of obtaining institutional approval of their relocation plan, and expects to have a proposal to the Cooperative State Research Service by early April. Funding should be completed by late May or early June.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of Fiscal Year 1986?

Dr. JORDAN. The land transfer was initiated in Fiscal Year 1985. However, the transfer was not completed until January 1986. $1,200,000 was appropriated in Fiscal Year 1985 but was to be carried over into fiscal year 1986 and remain available until expended.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. The relocation of an experiment station such as Fort Stanton creates many problems as well as many opportunities. The opportunities arise within the restructuring of research concepts. The University has been developing a consensus on the concept and specific plans for the relocation. The grant funds for relocation may be used over a period of time not to exceed five years.

Mr. WHITTEN. What is the cost of completing this work?

Dr. JORDAN. The $1,200,000 appropriated in Fiscal Year 1985 will fulfill the CSRS contribution to complete the relocation of the experiment station.

WARMWATER AQUACULTURE, MISSISSIPPI

Mr. WHITTEN. Fully describe the work that has been done under this program to date and the period of the existing contract.

Dr. JORDAN. This grant was awarded to Mississippi State University to expand the scope of the warmwater acquaculture research program currently in place. Project areas include water quality, disease control, species improvement, nutrition, product quality, cultural practices, processing and marketing, economics and management and technology transfer. Federal funds expended under the program have been matched by state appropriations.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated as of fiscal year 1986?

Dr. JORDAN. A grant has been awarded for FY 1985 for $3,500,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The program is directed under the auspices of the Mississippi Agricultural and Forestry Experiment Station with field and laboratory facilities located on the Main Campus and at the Delta Branch Experiment Station, Stoneville.

Mr. WHITTEN. What has been accomplished to date and what work remains to be done?

Dr. JORDAN. In 1985, research strategy and the prioritization of research program areas and projects within areas was developed. Ten project proposals have been drafted. In 1986, research is being initiated in seven of the project areas and ponds, raceways, a water quality laboratory and a nursery and hatchery will be constructed to accommodate the expanded program. The research grant funded in fiscal year 1985 may be used over a period of up to five years for completion of the studies proposed in the grant.

NATIVE LATEX ACT

Mr. WHITTEN. Explain how the $702,000 available in Fiscal Year 1986 for the Native Latex Act will be used.

Dr. JORDAN. In Fiscal Year 1986, research will be conducted on breeding and selecting for increased rubber productivity 36%, regional trials for testing improved lines 11%, maintenance of seed nurseries 5%, agronomic research to develop improved seeding processing and shrub management technologies 26%, processing research for improved extraction of rubber, resin and their subsequent separation 15%, harvest mechanization to develop machinery for harvesting, handling and transporting shrubs 2%, and research to reduce the loss from guayule diseases 5%.

Mr. WHITTEN. In last year's hearing record you stated that the program presently has the qualified human resources, the coordination and facilities to develop all phases of the technology necessary for producing guayule and extracting latex, but the program does not have the resources necessary to develop technologies to fully exploit the economic potential of byproducts. Please explain for the record what resources are necessary to fully develop this product and how they would be used.

Dr. JORDAN. Based on the present economy and current technology, income from the resin and perhaps the bagasse will be required to commercialize guayule and develop a mature, internationally competitive native rubber industry. Guayule produces roughly equal concentrations of rubber and resin. The resin should have a value in the chemical industry, but this value needs to be further elucidated, enhanced if possible, and markets identified. The same is true of the bagasse.

RANGELAND RESEARCH

Mr. WHITTEN. For Fiscal Year 1986, $500,000 was provided for rangeland research. Please explain how these funds are to be used.

Dr. JORDAN. A request for proposals will be announced in the Federal Register. The deadline for proposals is expected to be May 15, 1986. The proposals will be evaluated with recommendations submitted to me by July 1986, and the successful proposals will be funded by September 1986. Proposals will be considered in the following specific areas: management of rangelands and agricultural land as integrated systems for more efficient use of water and improved water yield, water quality, and water conservation, to protect against onsite and offsite damage of rangeland resources from floods, erosion and other detrimental influences, and to remedy unsatisfactory and unstable rangeland conditions; revegetation and rehabilitation of rangelands including the control of undesirable species of plants. Individual proposals will be limited to $80,000 which will allow the funding of six to ten proposals.

GULF COAST SHRIMP RESEARCH

Mr. WHITTEN. Please give a status report of the Gulf Coast shrimp aquaculture research project.

Dr. JORDAN. In Fiscal Year 1985, grants were awarded to the Oceanic Institute, Hawaii and the Gulf Coast Research Laboratory, Mississippi for the initiation of a research program to further develop an economically viable commercial marine shrimp industry in the United States. Disease aspects of the research are being carried out under a subcontract with Tufts University, Massachusetts. Research has been initiated and a comprehensive plan developed to find solutions to the present constraints on shrimp production. There are also efforts to expand cooperation under this grant to include Texas A&M University, the University of Hawaii and the State of South Carolina, Division of Marine Resources.

Commercial shrimp production, while increasing rapidly in Central America and a number of Asian countries, is not yet economically feasible in the United States. The importation by the U.S. of more than $1 billion worth of shrimp annually provides real justification for determining how to stimulate domestic production. Efforts in 1986 under this grant will concentrate on the present greatest constraints to domestic production, including a comparison of alternative production systems and ways to artifically enhance reproductive capacity in selected marine species. A maturation facility under construction at the Gulf Coast Research Laboratory will permit studies of factors influencing the early maturation and development of marine shrimp under domestic conditions.

1890 RESEARCH FACILITIES

Mr. WHITTEN. For fiscal year 1986, Congress appropriated $10 million for research facilities at the 1890 colleges. How will these funds be used, by college?

[The information follows:]

Funds appropriated by the Congress for research facilities at the 1890 colleges amounted to $9,508,000 for fiscal year 1986 under Gramm-Rudman-Hollings.

Alabama A&M University will renovate greenhouse facilities and research laboratories.

Tuskegee University has decided to construct swine research facilities and an animal care research facility.

University of Arkansas at Pine Bluff plans to construct poultry research facilities.

Delaware State College anticipates it will use funds to continue the construction of a new research annex.

Florida A&M will purchase major research equipment.

Fort Valley State College, Georgia has plans to renovate the human nutrition laboratories.

Kentucky State University funds will be utilized in renovation work underway on the main research complex.

Southern University, Louisiana has designated the funds to greenhouse construction.

The University of Maryland-Eastern Shore has plans to purchase an electron microscope and other major research equipment.

Alcorn State University, Mississippi has development plans for apiary facilities.

Lincoln University, Missouri plans construction of research facilities for the management and production of livestock.

North Carolina A&T State University facilities funds have been set aside to continue the planning and renovation of the recently purchased building for agricultural research.

Langston University, Oklahoma will develop goat research facilities.

South Carolina State College funds will be used to continue the construction of the new research laboratory complex.

Tennessee State will again assign funds to a proposed new construction project to provide research labs and offices.

Prairie View A&M University, Texas will initiate construction of a research laboratory/office building.

Virginia State University continues to designate its funds to the proposed research laboratory.

ANIMAL HEALTH AND DISEASE RESEARCH

Mr. WHITTEN. For the record, please provide a table which lists all the schools receiving formula grants for animal health and disease research and all the schools receiving special and competitive grants for animal health research for fiscal year 1986. Please include the amount of each grant program on the same table.

Dr. JORDAN. The Animal Health Special Research Grants and the Animal Science Competitive Research Grants have not yet been awarded for fiscal year 1986. However, we can provide this information for fiscal year 1985.

[The information follows:]

Animal Health Research Program
Fiscal Year 1985
(In Dollars)

State/Recipient	Animal Health and Disease Research Sec. 1433	Special Research Grants	Competitive Research Grants
ALABAMA: Auburn University	$116,592	$81,611	--
Tuskegee University	10,988	--	--
University of Alabama	--	--	--
ALASKA: University of Alaska	9,318	--	--
ARIZONA: University of Arizona	57,164	--	--
ARKANSAS: University of Arkansas	78,085	--	--
CALIFORNIA: Univ. of California, Berkeley	245,028	--	--
University of California, Davis	196,346	76,129	$555,000
COLORADO: Colorado State University	230,633	214,428	--
CONNECTICUT: Univ. of Connecticut, Storrs	23,806	296,796	--
DELAWARE: University of Delaware	14,830	--	--
FLORIDA: University of Florida	131,868	50,131	225,000
GEORGIA: University of Georgia	172,850	114,454	130,000
HAWAII: University of Hawaii	7,943	--	--
IDAHO: University of Idaho	80,325	--	--
ILLINOIS: University of Illinois, Champaign	--	149,935	--
University of Illinois, Urbana	179,934	243,854	175,000
INDIANA: Purdue University	123,252	--	199,000
IOWA: Iowa State University	326,405	367,955	100,750
University of Iowa	--	--	--
ARS, USDA Ames, Iowa	--	--	171,000
KANSAS: Kansas State University	184,651	--	207,800
KENTUCKY: University of Kentucky	98,092	105,000	--
LOUISIANA: Louisiana State University & A&M College	110,604	112,373	--
MAINE: University of Maine	18,102	--	--
MARYLAND: University of Maryland	48,548	--	--
MASSACHUSETTS: University of Massachusetts	10,620	--	--
Tufts University	51,016	--	--
MICHIGAN: Michigan State University	103,969	295,680	--
MINNESOTA: University of Minnesota	193,297	490,200	181,000
MISSISSIPPI: Mississippi State University	52,007	--	--
University of Mississippi Medical Center	--	--	--
MISSOURI: University of Missouri	141,305	--	139,000
MONTANA: Montana State University	77,156	97,235	--
NEBRASKA: University of Nebraska	193,987	149,269	--
NEVADA: University of Nevada	17,365	--	222,000
NEW HAMPSHIRE: University of New Hampshire	11,190	--	--
NEW JERSEY: Rutgers University	26,978	--	--
NEW MEXICO: New Mexico State University	41,159	--	--
NEW YORK: Cornell University	272,483	--	679,800
NORTH CAROLINA: North Carolina State Univ.	100,061	138,404	245,000
NORTH DAKOTA: North Dakota State University	58,502	249,841	--
OHIO: Ohio State University	124,095	385,691	140,000
OKLAHOMA: Oklahoma State University	125,298	150,000	--
OREGON: Oregon State University	95,819	90,000	--

State/Recipient	Animal Health and Disease Research Sec. 1433	Special Research Grants	Competitive Research Grants
PENNSYLVANIA: Pennsylvania State University	$52,337	$282,781	$215,850
University of Pennsylvania ..	108,886	90,465	--
PUERTO RICO: University of Puerto Rico	14,543	--	--
RHODE ISLAND: University of Rhode Island ..	14,910	--	--
SOUTH CAROLINA: Clemson University	23,555	--	--
University of South Carolina.	--	29,511	--
SOUTH DAKOTA: South Dakota State University	96,112	68,007	--
TENNESSEE: University of Tennessee	70,441	299,418	220,000
TEXAS: Texas A&M University	346,564	123,826	--
Baylor College of Medicine	--	136,331	34,000
UTAH: Utah State University	57,344	--	--
VERMONT: University of Vermont	18,298	--	--
VIRGINIA: Virginia Polytechnic Institute and State University	90,624	149,529	160,150
WASHINGTON: Washington State University ...	150,641	539,466	132,000
WEST VIRGINIA: West Virginia University ...	16,267	--	--
WISCONSIN: University of Wisconsin	208,846	183,480	189,000
WYOMING: University of Wyoming	43,265	--	--
Total	5,474,304	5,761,800	4,321,350

RESULTS OF THE ANIMAL HEALTH AND DISEASE RESEARCH PROGRAM

Mr. WHITTEN. Please list a sample of products that have resulted from funds available through the animal health and disease research program. How have these results been disseminated to farmers?

Dr. JORDAN. Research conducted with Section 1433 Animal Health and Disease Research formula funds have resulted in a number of products which will contribute to more effective control of animal diseases. Examples include the development of a new vaccine to assist in the control of Foot Rot in sheep by scientists in Colorado. A computerized system of surveillance of broiler health was developed by scientists in Mississippi for poultry producers. This system assists in the detection and elimination of subclinical infections, thus, improving health management practices and profitability. Missouri scientists have developed a rapid inexpensive analytical method for the detection of mycotoxins in grains and feeds. This new test permits the monitoring for mycotoxin contamination of large numbers of samples at minimal costs to livestock producers. This information has permitted early advice to be given to livestock owners and veterinarians on potential hazards to mycotoxins. The cause and prevention of the Fat Cow Syndrome was determined by Michigan scientists. This disease can now be prevented by proper energy levels in the diets during late pregnancy. A new antimicrobial agent for the treatment of bacterial diseases of catfish was tested and evaluated by research scientists at Mississippi State University. This new antibacterial agent was found to be effective against many bacterial diseases and promises to greatly assist the catfish industry. Scientists at several institutions have developed new disease diagnostic procedures known as ELISA tests for several diseases such as bovine viral diarrhea, fluke infections, and Johnes Disease. These ELISA tests are reliable, fast and relatively inexpensive. The development of these tests makes it possible to detect the causative agents of livestock and poultry diseases much more rapidly which results in more efficient treatment and control. Scientists at the Ohio State University have discovered an effective way to prevent the development of milk fever in dairy cows by the administration of a metabolite of Vitamin D immediately prior to parturition. This active metabolite stabilizes the blood calcium, phosphorus, and magnesium concentrations of pregnant cows. This product could result in substantial financial savings to dairy producers through the prevention of this metabolic disease.

All of these new developments are or will be made available to producers through practicing veterinarians, state agricultural extension agents, animal disease diagnostic laboratories and through private biological companies.

NORTHERN MARIANAS

Mr. WHITTEN. Please provide detailed information on the CSRS activities in the Northern Marianas, including cost, type of research, goals, and/or products expected, and the anticipated length of the research.

Dr. JORDAN. CSRS has provided assistance to the Northern Marianas in support of agricultural research since 1983. There is a shortage of locally grown foods resulting in a dependency on imported goods and cash flow from the islands. The cooperative program is designed to assist in addressing these problems. CSRS provided $70,000 for this research in FY 1986. Subject to availability of funds, this is expected to be a continuing program. During FY 1986, research on varietal selection of bell peppers and the potential of soursop as a new crop for the Northern Marianas has continued.

HIGHER EDUCATION STRENGTHENING GRANTS

Mr. WHITTEN. Please explain in detail the purposes of the higher education strengthening grants program.

Dr. JORDAN. In recent years, the research and extension programs and facilities at the 1890 land-grant institutions have been strengthened through the provisions of Sections 1444 and 1445 of P.L. 95-113, as amended, and Section 1433 of P.L. 97-98.

In FY 1985, approximately $107,000 was made available to each of the eighteen eligible institutions under a strengthening grants program. Funds were used to strengthen student recruitment and retention programs. Sixteen projects focused on recruiting and retaining students, with special emphasis on competencies and skills deemed essential for success as food and agricultural professions. Activities funded by institutions are, enrichment/awareness programs in agriculture for current or potential students; development and distribution of promotional materials; and faculty participation in workshops, symposia, and local, regional, and national meetings focusing on career information and employment opportunities. Two institutions were funded to purchase instructional equipment. Primary emphasis was placed on equipment which could be centrally located and shared among departments for overall program enhancement.

In FY 1986, total funding available for this program is $1,902,000. This amounts to $102,496 per institution.

CONSULTANTS

Mr. WHITTEN. Please list for the last 5 years all consultants, amounts paid, and for what purposes they were used.

Dr. JORDAN. The Competitive Research Grants program provides support for basic research in selected high priority areas. To maintain a program of the highest quality and leadership of the highest caliber, scientists are recruited from throughout the entire U.S. scientific community to fill the Chief Scientist and Program Manager positions. Beginning in fiscal year 1984, the program managers have been hired as experts and given intermittent appointments. We will supply this information for the record.

[The information follows:]

	Salary and benefits
Fiscal Year 1986 (Est.):	
Edwin Bingham	$13,990
Bob Buchanan	13,990
William Clifford	13,990

William Davis	13,990
Thomas Elder	1,240
Neal First	13,990
Donald Gustafson	13,990
Edgar Kendrick	17,000
George Kennedy	13,990
Ralph Quatrano	13,990
Glenn Schmidt	13,990
Malcolm Smith	13,990
Cecil Stewart	13,990
Patricia Swan	13,990
Bart Thielges	1,930
James Tiedje	13,990
David Timothy	36,400
Olen Yoder	13,990
Total	252,430

Fiscal Year 1985:	
Donald Arganbright	8,149
Elwood Caldwell	3,646
Thomas Elder	1,543
Paul Goetinck	9,650
Irving Goldstein	4,289
William Hansel	6,004
Andrew Hanson	10,028
Alan Hooper	13,706
Andrew Jackson	8,363
Brian Larkins	8,363
Lowell Nault	12,787
James Olson	14,411
Donald Ort	414
William Pritchard	7,291
Charles Roth	1,398
Luis Sequeira	10,541
Ian Sussex	8,363
Bart Thielges	13,724
David Timothy	31,321
Veril Van Volk	2,788
Joseph Varner	9,156
Total	185,935

Fiscal Year 1984:	
John Biggins	8,451
Andrew Jackson	8,039
George Kennedy	11,337
Tsune Kosuge	26,494
Bryan Larkins	8,657
Donald Phillips	9,418
Clarence Ryan	5,617
Jon Story	9,766
Total	87,779

COOPERATIVE FORESTRY RESEARCH

Mr. WHITTEN. Please provide for the record a ten-year table showing the amount appropriated each year for the cooperative forestry research program.

[The information follows:]

McIntire-Stennis Cooperative Forestry Research

[In thousands of dollars]

Fiscal Year:	*Appropriated Funds*
1986 (Gramm-Rudman-Hollings)	$12,412

1986	12,975
1985	13,053
1984	12,702
1983	12,452
1982	12,031
1981	10,774
1980	10,000
1979	9,500
1978	9,500
1977	8,212

SMALL BUSINESS INNOVATION DEVELOPMENT ACT

Mr. WHITTEN. In fiscal years 1985, 1986, and 1987, what will be the agency contributions for the Small Business Innovation Development Act?

Dr. JORDAN. The Small Business Innovation Development Act, Public Law 97-219, July 22, 1982, provides that 1.0 percent of an agency's extramural research budget in fiscal year 1985 be set-aside for purposes of the SBIR Act. In fiscal year 1986, and all subsequent years, the act provides that the set aside be increased to 1.25 percent. Under provisions of the Act the USDA has allocated $3,150,946 in fiscal year 1985 for the Small Business Innovation Research Program. The fiscal year 1986 program was estimated to be $3,640,215 prior to Gramm-Rudman-Hollings. The reduced fiscal year 1986 level is $3,477,773 and the fiscal year 1987 estimate is $3,062,816.

Mr. WHITTEN. How many inquiries were received in fiscal year 1985?

Dr. JORDAN. Approximately 3,800 solicitations were mailed to persons requesting information on the USDA SBIR programs.

Mr. WHITTEN. How many proposals were received and how many were awarded?

Dr. JORDAN. There were 314 proposals received by the SBIR program in year 1985. Thirty-four awards were made.

Mr. WHITTEN. Please describe for the record each of the contracts awarded, indicating the dollar amount and the terms of the contract.

[The information follows:]

SMALL BUSINESS INNOVATION RESEARCH PROGRAM
PROGRAM AREA: AIR, WATER & SOILS

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Agricultural Electronics Corporation 4020 East Coronado Drive Tucson, AZ 85718	William Gensler	$49,912	09/15/85	03/31/86	An Active Electrochemical Instrument System for Determination of Water Stress
Kamterter, Inc. P.O. Box 30327 Lincoln, NE 68503	John A. Eastin	$200,000	09/15/85	09/30/87	Facilitating the Colonization of Plant Roots by Beneficial Microorganisms
R&A Plant/Soil, Inc. 24 Pasco - Kahlotus Road Pasco, WA 99301	Blaine Metting	$49,596	09/15/85	03/31/86	Palmelloid Microalgae as Soil-conditioning Agents

TOTAL $299,508

SMALL BUSINESS INNOVATION RESEARCH PROGRAM
PROGRAM AREA: ANIMAL PRODUCTION & PROTECTION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Memory Metals, Inc. 84 West Park Place Stamford, CT 06901	James Stice	$46,720	09/15/85	03/31/86	Natural Ventilation Management of Livestock Buildings using Shape Memory Alloys
Prime-Color, Inc. 8 Knight Road Wayne, NJ 07470	W. A. Thornton	$43,167	09/15/85	03/31/86	Lamplight Designed Specifically to Ease USDA Meat-Inspection
Bionique Laboratories, Inc. Bloomingdale Road Saranac Lake, NY 12983	Steven J. Geary	$49,974	09/15/85	03/31/86	Improved DNA Probe for the Rapid Detection of Mycoplasma gallisepticum
Lee Scientific, Inc. 379 N. University, #102 Provo, UT 84601	Douglas Later	$49,996	09/15/85	03/31/86	Supercritical Fluid Extraction and Analysis of Residues in Meats

TOTAL $189,857

SMALL BUSINESS INNOVATION RESEARCH PROGRAM
PROGRAM AREA: FOOD SCIENCE & NUTRITION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Hemogenetics, Inc. P.O. Box 5459 Berkeley, CA 94705	G. P. Der-Balian	$50,000	09/15/85	03/31/86	Salmonella Measurement with Bioluminescent Immunoassay
IDETEK, Inc 1057 Sneath Lane San Bruno, CA 94066	Prithipal Singh	$45,000	09/15/85	03/31/86	A Non-Instrumented Immunoassay for Aflatoxin B_1
ST&E Technical Services, Inc. 20 Belinda Court San Ramon, CA 94583	Stanley Klainer	$40,000	09/15/85	03/31/86	Unique Measurement of Nutrients Fluxes Using Fiber Optics
Hawaii Biotechnology Group, Inc. 99-193 Aiea Heights Drive Aiea, HI 96701	Douglas C. Vann	$200,000	09/01/85	08/31/87	Rapid Detection of Carbamate Pesticides in Food and Environmental Samples
Lenbeck Associates, Inc. 7900 College Boulevard Overland Park, KS 66210	Henry G. Lenbeck	$48,709	09/15/85	03/31/86	Containerized Bulk Export Shipment of Wheat Flour and Other Powder and Granular Food Products

SMALL BUSINESS INNOVATION RESEARCH PROGRAM
PROGRAM AREA: FOOD SCIENCE & NUTRITION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Universal Sensors, Inc. P.O. Box 736 New Orleans, LA 70148	Glenn Lubrano	$40,625	09/15/85	03/31/86	Rapid, Novel Methods for Determining Total Protein, Protein Quality, and Sucrose
Innovative Tehcnology, Inc. Box 10072, Southern Station Hattiesburg, MS 39406	Willard Douglas	$50,000	09/01/84	08/31/86	Development of Dry Film Assay for the Rapid Detection of Trichinosis in Swine
American Research Corporation of Virginia P.O. Box 3406 Radford, VA 24143	Russell Churchill	$249,000	09/15/85	09/30/87	Laser Diagnostics of Microbial Populations in Food Processing Systems

TOTAL $723,334

SMALL BUSINESS INNOVATION RESEARCH PROGRAM
PROGRAM AREA: FOREST & RELATED RESOURCES

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Engineering Data Management, Inc. P.O. Box 1774 Ft. Collins, CO 80522	G. Brent Fagan	$195,000	09/01/85	08/31/87	Reliable Strength Assessment of Wood Composites Using Non-destructive Evaluation Techniques
Woodland Services, Inc. Box 257 Moose Lake, MN 55767	David L. Eggen	$50,000	09/15/85	03/31/86	Integration of Mechanical and Chemical Forest Site Preparation Techniques
Mater Engineering, Ltd. P.O. Box O Corvallis, OR 97339	M. Scott Mater	$47,520	09/15/85	03/31/86	Lumber Yield Value Optimization through Market-responsive Log Yard Management
National Gypsy Moth Management Group, Inc. R. D. #1, Box 715 Landisburg, PA 17040	Mark Ticehurst	$34,776	09/15/85	03/31/86	Reducing Cost and Improving Effectiveness of Gypsy Moth Parasites in IPM
Efficient Machinery Company 220 - 111th Avenue, S.E. Bellevue, WA 98004	Peter Hammerschlag	$250,000	09/15/85	09/30/87	Systematic Analysis of Central Passage Circular Sawing Processing

SMALL BUSINESS INNOVATION RESEARCH PROGRAM
PROGRAM AREA: FOREST & RELATED RESOURCES

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
AMINEX Company P.O. Box 4174 Federal Way, WA 98063	Robert Arsenault	$45,970	09/15/85	03/31/86	Stress Wave Analysis of Wood Piles Related to Ultimate Compressive Strength

TOTAL $623,266

OBJECT CLASSIFICATION

Mr. WHITTEN. In the explanatory notes on page 7-5, Object Classification, you are showing a 70-percent reduction under other services. Please explain for the record the reasons for this significant decrease.

Dr. JORDAN. The reduction of $45,101,000 in the CSRS budget level from fiscal year 1986 to fiscal year 1987 results in a reduction of $1,795,580 for Federal administration. The full-time equivalent staff-year level of 140 remains the same in 1986 and 1987. It is necessary that we maintain the salary costs and other related expenses needed to support 140 staff years. In order to absorb the cut in Federal administration we will have to reduce the services performed under object class 25.

NATIONAL PESTICIDE INFORMATION RETRIEVAL SYSTEM

Mr. WHITTEN. How many individuals or groups accessed the National Pesticide Information Retrieval System in 1985?

Dr. JORDAN. During 1985, 200 member organizations accessed the National Pesticide Information Retrieval System—NPIRS. This represents approximately 350 individuals in the private, public and federal sectors.

Mr. WHITTEN. What is the annual cost of this system?

Dr. JORDAN. The operational budget for fiscal year 1986 for NPIRS is $327.000.

Mr. WHITTEN. How is it paid for?

Dr. JORDAN. $217,000 will come from user fees, and the USDA will provide $110,000. It is projected that user fees will completely cover the NPIRS operational budget for fiscal year 1987. The USDA will be requested to provide funds for future development to enhance the system.

CRITICAL AGRICULTURAL MATERIALS ACT

Mr. WHITTEN. Dr. Jordan, we have been advised that the Department has placed increased emphasis on alternative crops for industrial purposes as provided by the Critical Agriculture Materials Act. Efforts are underway in Mississippi along those same lines and which also come under the Critical Agriculture Materials Act. Given these facts, what is the basis for the proposed reduction in funding for this important program?

Dr. JORDAN. This reduction is proposed in line with the administration's overall reductions in Federal spending. Due to the discretionary nature of the Hatch Act and related formula base funded programs, amounts allotted to State institutions permit the institutions to fund research in those areas that they identify as high priority. This flexibility can provide for maintaining the highest priority programs. It is anticipated that the Directors of the State Agricultural Experiment Stations, working within the flexibility allowed by the formula funded programs, will reassess their research priorities. In that process, some of the research on alternative crops for industrial purposes judged to be most important may be continued.

Mr. WHITTEN. Mrs. Smith.

HIGHER EDUCATION PROGRAM

Mrs. SMITH. Tell us about your graduate student program? What kinds of students does this program attract?

Dr. JORDAN. This program was initiated in FY 1984 with a $5 million appropriation. Funds appropriated in FY 1985 were used to support the second year of training for some 302 graduate fellows, 259 doctoral and 43 master's students, at 47 institutions across 35 states. In FY 1986 the program is supporting the third and final year of training, for 259 doctoral students. Of those institutions supporting doctoral students, approximately 80 percent are land-grant and 20% are nonland-grant. The program boasts a 99 percent retention rate for fellows in the program.

We are extremely pleased with the qualitative aspects of the fellows as well and will provide information for the record.

[The information follows:]

Average Graduate Record Examination scores for doctoral fellows are as follows:

Biotechnology	1,394
Food Science and Human Nutrition	1,294
Agricultural Marketing	1,265
Agricultural Engineering	1,235

and for Master's fellows:

Agricultural Engineering	1,420
Food Science	1,211

The national average GRE score for all graduate students in agriculture is 969; for biological sciences—1081. The difference in the overall national average and that of the USDA fellows is indicative of the high quality students the program has served to attract.

RESEARCH PLANNING

Mrs. SMITH. I was very interested to hear your comments on research planning. How effective do you think the effort will be and how will you know?

Dr. JORDAN. Since the planning effort involved the principal managers of the system and represents to a large extent consensus among the Experiment Station Directors, I think it will be unusually effective. Generally, plans that are derived by those who are responsible for carrying them out are much more effective than those directed from above. So the advantage of this one is that it was a cooperative effort designed among all the actors involved in research, extension and teaching with emphasis on research in the State Agricultural Experiment Stations. The impact of the effort will be recognizable by shifts in the expenditures at the individual station in concert with the overall plan; the mobilization of additional resources from a number of sources, including the State government and private industry; and the more timely delivery of new knowledge at the time it is needed by the farmer and rancher of America. The key to success will be the anticipation of needs in enough time to have the experimental results before a particularly debilitating event occurs. The overall result will be most visible in terms of increasing the competitive position of the American farmer and rancher on the international scene.

SCIENTIFIC QUALITY OF RESEARCH

Mrs. SMITH. How do you about assuring the scientific quality of the research funded through the State-Federal partnerhip that is the State Agricultural Experiment Station system?

Dr. JORDAN. This is accomplished in three ways: national level program review, national level project review, and station level project review. All of these reviews involve a panel of scientific peers, fully competent to judge the quality of science and its place within the body of scientific knowledge. The program reviews are done on a periodic basis, generally twice in a decade, at every station for every program area. The panels generally involve four to six people brought from other institutions of higher learning or private research organizations, together with representation from USDA's science agencies. They generally involve two to five days and will review everything from a single department to an entire college, including the interrelationships of funding, faculty, university support, and scientific results. Of special interest is coordination among States and between the station staff and USDA scientists in applicable areas.

The national level review is accomplished for all Competitive Research Grants. As appropriate, an extensive panel of reviewers, which could number as many as 14, is called upon to review a particular project proposal. Every Special Research Grant program undergoes a peer review of some sort and those that involve more than one State are subjected to national level peer review panels.

Beginning in 1977, the USDA reviewed and approved plans for individual State stations to conduct peer review on every one of their projects funded either through the base funded programs of Hatch, McIntire-Stennis, and Evans Allen or Special Research Grants that are single State oriented. The results of these project reviews are monitored by CSRS and every program review involves a review of evidence of the effectiveness of the station level peer review on individual projects.

Many scientists involved in the NIH and NSF peer review processes are a part of the CSRS review process as well. They tell me that we have as competitive an approach and as rigorous a set of standards as any Federal agency.

NEW USES OF AGRICULTURAL COMMODITIES

Mrs. SMITH. What is the potential for new uses of agricultural commodities and what are you doing to promote these new uses?

Dr. JORDAN. Fourteen crops and aquaculture have been identified with potential for commercial development. Those crops with medium or long-term commercialization potential are being addressed by Science and Education cooperative research. For those with near term potential, barriers to achievement of that potential have been identified and developmental or demonstration projects are proposed in FY 1987.

For guayule, a domestic source of natural rubber for which the U.S. is totally dependent on foreign sources, a long-term program will continue in the Southwest with land-grant universities in Arizona, Texas, California and New Mexico, and a cooperative project

with the Department of Defense, Gila River Indian Community and Firestone as participants.

For kenaf, an annual fiber crop used to manufacture pulp and paper products, a demonstration project will continue across the southern U.S. with USDA, Kenaf International, land-grant universities, Agricultural Experiment Stations and pulp and paper mills as participants.

For aquaculture, a demonstration project is proposed to promote hybrid striped bass production for the East Coast from Florida to New York for the seafood industry and markets. The project is directed to demonstrate economic viability, conduct test marketing and develop educational and technical programs. Participants include USDA, University of Maryland, Maryland Departments of Agriculture and Natural Resources, U.S. Fish and Wildlife Service, Office of Sea Grant and private entities for land, feed and market research.

For jojoba, an oilseed crop with extreme high temperature and pressure industrial lubricant applications, a developmental project is proposed for the Southwest to establish industrial oil specifications and to improve harvest efficiencies to provide soil at competitive market prices. Participants include USDA, equipment manufacturers, private research organizations, farmers and the Jojoba Growers Association.

For meadowfoam; an oilseed crop with industrial oil applications in lubricants, textiles, paper, plastics, adhesives, surfactants, polymers, and basic fatty acids; a developmental project is proposed in the Pacific Northwest to identify markets, to test and establish performance specifications for the oil and to improve production and extraction efficiencies. Participants include USDA, growers, Oregon Meadowfoam Growers Association, Oregon State University and the State of Oregon.

For crambe, a source of erucic acid for specialty chemicals, a demonstration project is proposed for the Midwest to demonstrate economic feasibility of production and processing, to build a public/private infrastructure to promote commercialization and to develop products and markets. Participants include USDA, Iowa State University, New Mexico State University, State of Iowa and Humko Chemical.

Other crops with commercialization potential are continuously being assessed by the Office of Critical Materials. For example, Pyrethrum shows great potential in the Pacific Northwest as a domestic source of natural insecticide from the dried flower extract and would penetrate a $10–20 million import market.

As research and development activities continue throughout the U.S., many other crops will arrive at near term commercialization potential and be promoted through development and demonstration projects and programs. Other crops under active consideration include cuphea for lauric acid, winter rapeseed for erucic acid, Chinese tallow tree for hard vegetable tallow and oil, lesquerella to replace imported castor oil, Stokes aster for epoxy fatty acids, lunaria for erucic acids and long-chain oleic fatty acids and tree crops and wood byproducts for wood and char fuels, chemicals, high performance papers, decorative lumber and veneers, and composite materials.

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Mr. WHITTEN. Mr. Traxler.

HATCH FUNDING LEVELS

Mr. TRAXLER. Dr. Jordan, the requested appropriation for Hatch Act funding is the same as the amount available for fiscal 1986, and is only about $170,000 over fiscal 1985. This amount certainly doesn't keep pace with inflation, and I understand that inflation in these activities is usually higher than the consumer price index.

What does this fairly constant dollar level of funding mean for experiment stations at land grant colleges? Are we at risk of losing our research capabilities?

Dr. JORDAN. The constant level of funding for the Hatch Act will be addressed by each State in the light of its overall funding situation. For some, it will be possible to shift funds from other sources to avoid serious program disruptions. Some will maintain salaries, but reduce operating funds for their programs. Some others that face level or reduced State funding may elect to eliminate some of their lowest priority projects in order to adequately support those of higher priority. It is our judgement that in the short run, in the current environment of everyone doing their fair share in minimizing the budget deficit, the program can withstand this budget restriction without serious loss of research capability.

HATCH ACT

Mr. TRAXLER. Would you provide for the record a table showing the dollars appropriated for Hatch Act activities for each fiscal year since fiscal 1981, both in actual and constant dollars.

[The information follows:]

HATCH ACT

[In thousands of dollars]

Fiscal year	Appropriation	Constant 1981 dollars[1]
1987	$155,545	$118,402
1986	148,792	117,873
1985	156,484	128,320
1984	152,281	130,487
1983	149,295	133,693
1982	141,109	131,796
1981	128,615	128,615

[1] Source: Economic Report of the President, February 1986, Implicit Price Deflators for GNP, 1929–85; OMB projections—1986 and 1987.

SPECIAL RESEARCH GRANTS

Mr. TRAXLER. Every one of the special research grants is proposed for elimination. Can you tell me which of these grants can be discontinued because the work has actually been completed?

Dr. JORDAN. The discontinuation of funding for Special Research Grants does not mean that research on these problems will stop. Grants awarded from fiscal year 1986 funds will be available to complete the objectives over a period of up to five year as outlined in the funded proposals.

Mr. TRAXLER. Which of these grants in your estimation are at points close to resolving the problems they are designed to solve?

Dr. JORDAN. The Special Research Grants program has lead to the resolution of many critical problems, for example the recent development of a new test and vaccine for vesicular stomatitis in cattle. However, this program has concentrated on complex problems of local, State and national interest many of which require a concerted effort over time. It is anticipated that the flexibility in the formula program will allow the States to continue working on many of these high priority problems.

PEST MANAGEMENT PROGRAMS

Mr. TRAXLER. I am hearing from researchers in Michigan that one of the most vital areas of research under special grants is the pest control work carried out under Integrated Pest Management, Pesticide Clearance, and Pesticide Impact Assessment, the so-called "IR-4" programs. Total funding for these programs is approximately $6.8 million. What is the value returned from these programs? Doesn't it hold the potential for outweighing the cost?

Dr. JORDAN. These research programs are highly complementary in that the data generated from them allow more valid decisions to be made regarding issuance of new Federal registrations of pesticides for use on minor or specialty crops, assess the need to maintain existing registrations of pesticides having suspect environmental hazards, and provide bases for development of system approaches for safe, economical pest management. These research programs have provided USDA with a valuable and much needed data base that will help support a leadership role in agricultural pest management. The ultimate total value of the programs, as related to costs, is encompassed in provision of pest management systems with reduced adverse environmental impacts and assurance to consumers of an economical, safe and wholesome food supply.

Mr. TRAXLER. Please describe the work being conducted under each of these projects, and the location of the work.

Dr. JORDAN. Integrated Pest Management is a national program that integrates systems-ecological strategies and biotechnological breakthroughs with future integrated crop systems. The objectives of the program are to develop production system models for the purpose of detailing the function of each agroecosystem being studied; reduce crop and livestock losses due to pests in an economically sound manner; and design and provide for implementation of pest management systems and associated strategies and tactics into selected agroecosystems. The national effort is comprised of four regional programs that encompass the administrative and leading technical expertise of the entire Land Grant System. Approximately ten major commodities have been extensively analyzed for key factors contributing to current crop losses and priority research has been identified to enhance productivity and profitability. A regional/national competitive grant program that is open to scientists in the entire Land Grant System is in place to solicit and award most promising research projects on priority areas indentified as significant barriers to productivity. In FY 86, research proposals are being solicited for competitive peer review in the follow-

SMALL BUSINESS INNOVATION RESEARCH PROGRAM
PROGRAM AREA: PLANT PRODUCTION & PROTECTION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Plant Genetics, Inc. 1930 Fifth Street Davis, CA 95616	M. K. Redenbaugh	$47,880	09/15/85	03/31/86	Artificial Seeds: Encapsulation of Somatic Embryos
STSE Technical Sevices, Inc. 20 Belinda Court San Ramon, CA 94583	Stanley Klainer	$40,000	09/15/85	03/31/86	Fiber Optic Chemical Sensors for In-Situ O_2, CO_2, and H_2O Measurements During Photosynthesis
Citrex Technologies, Inc. 728 NW Avenue Gainesville, FL 32602	John D. Cox	$49,815	09/15/85	03/31/86	The Use of X-rays to Disinfest Grapefruit of Carib Fly within the Packinghouse
Photics, Inc. 98 Old Lowell Road Westford, MA 01886	Rudolph Bradbury	$230,000	09/15/85	09/30/87	Holographic Sunlight Distribution for High Efficiency Greenhouses
Bio-Metric Systems, Inc. 9932 West 74th Street Eden Prairie, MN 55344	Patrick E. Guire	$249,000	09/15/85	09/30/87	Enzyme Immunoassay Technology and Fieldable Assay Kits for Plant Pathogens

SMALL BUSINESS INNOVATION RESEARCH PROGRAM
PROGRAM AREA: PLANT PRODUCTION & PROTECTION

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
Hunt Farms 4021 Italy Hill Road Branchport, NY 14418	Derek J. Wilber	$129,000	09/15/85	09/30/87	Management of Field Grafted Grapevines in Cold Climate Vineyards
Decagon Devices, Inc. NW 800 Fisk Pullman, WA 99163	Grant A. Harris	$33,295	09/15/85	03/31/86	A Rapid Method of Quantifying Root Area and Length

TOTAL $778,990

SMALL BUSINESS INNOVATION RESEARCH PROGRAM
PROGRAM AREA: RURAL & COMMUNITY DEVELOPMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
SRM Corporation 2653 West 32nd Avenue Denver, CO 80211	James A. Kent	$49,500	09/15/85	03/31/86	A New Method for Efficient Mapping of Human Geographical Boundaries in Rural Areas
DUAL-Comm, Inc. Suite 1250, 1015 Fifteenth St., N.W. Washington, DC 20005	John C. Beresford	$249,000	09/15/85	09/30/87	Local Area Leading Indicators
Associated Enterprise Development, Inc. 120 Admiral Cochrane Drive Annapolis, MD 21401	Leonard Blackshear	$44,895	09/15/85	03/31/86	Aiding Rural Goverments and Institutions through Voice Messaging Technology
Incubator Technologies, Inc. Twitty Park-Research Drive, Route 4, Box 519 Rolla, MO 65401	F. Terry Nixon	$100,000	09/01/84	08/31/86	Development of the High-tech Incubator Concept for a Rural/University Setting

SMALL BUSINESS INNOVATION RESEARCH PROGRAM
PROGRAM AREA: RURAL & COMMUNITY DEVELOPMENT

GRANTS AWARDED FOR FISCAL YEAR 1985

ORGANIZATION	PRINCIPAL INVESTIGATOR	AMOUNT	AGREEMENT PERIOD FROM	TO	TITLE
American Forest Mushroom Association, Inc. P.O. Box 1362 Asheville, NC 28802	Toby J. Farris	$49,860	09/15/85	03/31/86	Inoculation Techniques for Forest Mushroom (L. edodes) Production
E. P. Systems Group, Inc. 332 West Fairmont Avenue State College, PA 16801	Eugene J. Bazan	$42,738	09/15/85	03/31/86	The Feasibility of a Manual for Rural Economic Developers

TOTAL $535,991

ing commodity areas: alfalfa, potatoes, range, small grains, tree fruits, corn, confined livestock, dairy forage, apples, cotton, and soybeans. Additional commodity areas are currently being identified and priority research needs will be addressed in future years.

Pesticide Clearance appropriated funds are awarded equally to the Michigan, Florida, New York, California and New Jersey Agricultural Experiment Stations for partial support of a national program to develop research data supportive of registration of pesticides for minor and specialty uses. These research stations function as organizational centers serving all of the States within their respective regions, and in the process, provide funds and coordination to participating States for development and assessment of data such as efficacy, phytotoxicity and safety needed for Federal registration of pesticides.

Pesticide Impact Assessment appropriated funds are awarded to 53 States and Territories for support of assessment activities in the areas of research, information and coordination/liaison. Funds are also distributed regionally through four lead States. These funds are further awarded to scientists in each region to generate research data that are needed to make scientifically sound decisions on pesticide regulatory issues. Through a process of priority setting, research is initiated in areas that have been identified as potential regulatory needs. In FY 1986, the area of environmental fate, particularly the movement of pesticides into water, has received the highest priority in funding. Exposure research projects have also been funded from the perspective of improving application technology as well as post-harvest worker contact with pesticides. Research has also continued in the areas of resistance and economic benefits of pesticides.

UPDATES ON MICHIGAN PROJECTS

Mr. TRAXLER. A number of Special Research grants are operated in Michigan. They include bean and beet research, dairy and beef photoperiod research, blueberry shoestring virus research, potato research, asparagus yield decline research, stone fruit decline research, wood utilization and apple quality research. Could you provide us with an update on the work being conducted by each of these projects, including any information you have regarding whether or not any of these projects, expect to be completed during fiscal year 1986.

Dr. JORDAN. The bean and beet research project has helped to identify the morphological and physiological mechanisms which maximize the efficiency of water use by edible dry bean genotypes and to develop soil and crop management recommendations which will enhance dry edible bean yields on the fine textured soils of Michigan. In addition, environment by genotype interactions for root development of stress tolerant and sensitive genotypes of dry edible beans have been identified. The efficiency of carbon use by sugarbeets has also been determined. This project has also led to the development of integrated plant growth, soil, and environmental conditions for maximum yield management systems using Crop Environmental Resource Simulation prediction models for edible

dry beans and sugarbeets. Research proposed under the objectives of this project will be completed.

The potato research project has helped to produce high quality, uniform disease and insect resistant potato germplasm; improve potato variety propagation and evaluation procedures; improve marketing and utilization of potatoes; produce high quality potatoes for the fresh market; and develop recommendations for potato storage over an extended period. Research proposed under the objectives of this project will be completed.

The apple quality research project is being initiated in fiscal year 1986. It is expected to assist apple growers in developing handling, storage and transportation methods which will assure Michigan apple growers that their apples will reach the market place in high quality condition. Research proposed under the objectives of this project will be completed.

In the photoperiod studies at Michigan State, it has been determined that gradual transitions of light intensity at dawn and at dusk were more effective than an abrupt change from light to dark or dark to light in stimulating body growth in dairy heifers and bulls. In crossbred beef steers, gonadal secretions appear to be necessary for photoperiod enhancement of growth.

Future research plans using estrogen-progesterone implants with steers will address the hormone concept. Similarly, studies are planned to determine whether or not the ovary is essential in crossbred beef heifers to obtain a faster rate of growth in response to long-day photoperiods. Concurrently, animals will be cannulated to determine the effects of photoperiod and implants on concentrations of prolactin, growth hormones, insulin and cortisol in blood serum, thereby providing insights into the mechanisms involved in these treatments on growth rates. The fiscal year 1986 grant proposal has been received and we are in the process of awarding the grant. This grant will support research through October 1987.

The work in wood chemistry being conducted in the Forestry Department of Michigan State University is fundamental in nature. Tissue cultures of black locust have been successfully propagated. This clonal material is being analyzed to determine the alletrophic chemicals associated with this species with the intent of defining if black locust can be used to synthesize chemicals known to be resistant to some forms of biological agents. The study is in its infancy. Considerable progress has been made in the first phase of the study directed toward providing a continuum of black locust produced through tissue culture techniques. This biotechnological study may prove to be a means for the successful synthesis of promising chemicals from wood.

In blueberry shoestring virus—BBSSV—research supported by fiscal year 1985 funds, a new biotechnology tool known as dot-blot immunoassay was developed to give a 4- to 10-fold increase in sensitivity of virus detection, permitting a more accurate means of following virus multiplication in blueberry tissues at earlier periods following infection. It was found that BBSSV is present at high levels in non-commercial fields and wild blueberry species. This finding makes it important for growers to remove these virus sources adjacent to commercial fields in order to minimize vulnerability of new cultivars and maximize success of new disease man-

agement strategies. Since there is only limited resistance to BBSSV in commercial cultivars, the search for new improved resistance or tolerance to BBSSV has followed several paths. Native clones of blueberry have been screened and several currently have been found to be free of BBSSV. A long-term study was initiated to measure tolerance among the cultivars by various methods. Various crosses among commercial and wild blueberry genotypes were accelerated to increase the pool of genetic material available for determining the genetics of BBSSV resistance. Further study of spread of the aphid carrier of the virus showed that harvesting equipment can carry contaminated insects 32 meters down a row. It is therefore necessary that growers control the aphids before harvest to minimize virus disease spread. Insecticide tests showed that some materials repelled aphids from treated plants without killing them, increasing insect movement and potential for increased spread of virus. An aphid development model is being developed in order to better define vulnerable stages for different control strategies, including improved insecticides. Fiscal year 1986 Special Research Grant funds have been made available to the Michigan Station for a new project on BBSSV. The new project will deal with further analyses of cultivars and wild type selections. Back crosses will be made among various genotypes to further characterize genetics of resistance and to isolate genes for improved resistance or tolerance. Testing of insecticides and other chemicals to control aphid populations or feeding behavior will be conducted. The aphid development model will be fine-tuned.

In the asparagus yield decline research supported by fiscal year 1985 funds, it was found that two related viruses and a fungus disease known as *Fusarium* root and crown rot, are primary pathogens implicated in the decline. Laboratory and field studies indicate that the virus infections increase susceptibility to root and crown rot. Environmental stress research in progress implicates moisture stress and soil acidity as having an impact, but that temperature does not have an impact on yield decline. Initial studies show that chemicals present in asparagus residue move into soil and predispose the subsequent crop to *Fusarium* root and crown rot. It was found that biotypes of the fungus exist in areas never planted to asparagus, but having specific pathogenicity for the plant. Current research indicates that the genetic base of this specific asparagus pathogen is very broad. This explains why there is virtually no commercial asparagus germplasm with resistance or even tolerance to the fungus. Overseas exploration in areas of the Mediterranean region where asparagus originated has resulted in collection of a wide variety of asparagus and related species. These materials are being prepared for various screening tests. With fiscal year 1986 funding support, new research thrusts will deal with a field planting of asparagus, in which virus-infected and healthy plants were located, to be monitored to determine whether virus interactions or environmental factors impact on plant survival. Allelopathic compounds in asparagus residue will be identified, with the objective of evaluating their use as indicators of site vulnerability to root and crown rot. Soil pH, moisture level and nutritional status will be studied to determine specific interactions that impact on the incidence and severity of root and crown rot. Domes-

tic and foreign asparagus germplasm will be used in development of somatic embryos in tissue culture. The focus of new research will be in methods to identify and isolate genetic material with superior resistance or tolerance to yield decline agents.

Research on stone fruit decline supported by fiscal year 1985 special research grant funds found that a mycoplasma agency—cause of "X-disease"—*Cytospora* canker and cold hardiness appear to be the major decline factors in peach. Progress has been made in developing a biotechnology tool, known as monoclonal antibody, as a probe to determine mycoplasma presence in alternative plant hosts of X-disease. *Cytospora* fungus isolates are being screened, with the goal of finding a weakened or hypovirulent strain that could be used to transfer reduced pathogenicity to orchard populations of the fungus. Some success has been achieved in finding peach genotypes that come to full production earlier, thus minimizing the impacts of older orchard tree production loss. Research on cherries is also concerned with "X-disease", in addition to root problems associated with soil fungi and soil permeability. Two pathogenic fungi have been found in declining cherry orchards with poorly drained soils. The majority of tart cherries are shaker-harvested, and mehanical damage to tree trunks is widespread. These wounds provide entry for microbes and insect borers. Clamp design changes have been developed and recommendations to growers will be made in the near future. Cold injury also affects the health and longevity of sweet and tart cherry trees. Seedlings are being screened for improved hardiness and acclimatization attributes. Fiscal year 1986 grant funds have been made available for a new research project to continue development of the monoclonal antibody probe for detecting X-Disease in peach, cherry and other possible host plant species. Protoplast fusion technology will be applied to research on transfer of the pathogenicity attenuation factor to orchard population of the *Cytospora* fungus. Orchard ground cover plants will be tested for ability to penetrate orchard soil hardpans, improving soil drainage. Pheromone borer attractants will be investigated as a means to monitor insect life cycles for optional insecticide application strategies. Peach and cherry cold injury damage thresholds will be determined. Broad-scope screening will be conducted with cherry germplasm for genetic resistance or tolerance to diseases, winter hardiness and other orchard management-oriented attributes.

ANIMAL HEALTH RESEARCH

Mr. TRAXLER. There is a proposal to again terminate the animal health research program. I know you appreciate the fact that there had been a perception of a lack of interest in animal health research because in prior years there had not been particular funding directed to this program. If we approve the request to terminate these funds, isn't there the chance that the animal research community and livestock producers will get the wrong signals from the action?

Dr. JORDAN. There is a risk that this proposed action will be misinterpreted but animal health and disease research will continue to be conducted by Federal and State research institutions under

other authorizations such as the Hatch Act, Competitive Research Grants Programs in Animal Science and Biotechnology and appropriations to the USDA Agricultural Research Service. Additionally, it is assumed that State appropriations for animal health will continue to provide opportunity for solving a limited number of high priority problems of national significance.

Mr. TRAXLER. Which specific projects have been completed or are near completion utilizating these funds?

Dr. JORDAN. Grant awards under the Animal Health Special Research Grants program are usually awarded for a 2 or 3 year period. Occasionally extensions are approved to take advantage of unique situations. Therefore, essentially all research projects awarded during FY 1979 through FY 1983 will have been completed or are near completion. Projects awarded in FY 1984 and FY 1985 are in various stages of completion. Thirty-three projects were awarded for a 1 or 2-year period in FY 1984 and will be completed by September 30, 1986. Thirty-one projects were awarded for a 3-year period and will be completed by September 20, 1987, and two projects for a 4-year period will not be completed until September 30, 1988.

Under the Section 1433 formula program for animal health, research projects are usually approved for a three-year period. The total number of projects in this program is approximately 450. Approximately one-third of the projects would reach completion each year.

Mr. TRAXLER. Could you also describe the differences between the special grant program and the Section 1433 program?

Dr. JORDAN. The Section 1433 Animal Health and Disease Research Program is a formula program with a requirement that research be restricted to diseases and pests of food animals, including aquaculture, and horses; diseases of wildlife that endanger livestock production; diseases of animals transmissible to humans; and the control of livestock predators. Formula provisions of Section 1433 are unique in that funds are distributed to the States in relation to a State's livestock importance and its capacity to conduct animal health and disease research. State contributions to expand animal health research are encouraged through a requirement that each State match any Section 1433 funds received annually in excess of $100,000. Seventy-eight institutions currently are eligible to receive funds under the Section 1433 program. These include 40 State Agricultural Experiment Stations and 16 Colleges of Veterinary Medicine qualifying individually, plus 11 Experiment Stations and 11 Colleges of Veterinary Medicine qualifying as combined institutions. The funds allocated to the States are used to fund research projects on disease problems of a high priority within the State. The funds also are frequently used to support pilot research projects to enable research scientists to obtain preliminary results to provide the basis for a research proposal to the special grants or competitive grants program.

The Animal Health Special Research Grant Program is designed to support research seeking solutions to health problems of livestock, poultry, and major acquaculture species. Emphasis is placed on the solution of problems of highest priority and national importance. Grants of up to $150,000 are currently made for funded

projects. Priorities for the program are identified annually by the Animal Health Science Research Advisory Board through recommendations from national livestock and poultry commodity organizations and other groups concerned with animal health. This grant program uses a competitive process with peer panel evaluation of proposals. It supports high quality in-depth research by some of the most qualified animal health scientists on the major disease problems facing the livestock industries.

BIOMASS FROM DIARY PROCESSING WASTES

Mr. TRAXLER. Could you also update us on the work being conducted in Missouri under the biomass from dairy processing wastes program?

Dr. JORDAN. Blended effluents from dairy processing plants, after undergoing oxidation are referred to as dairy processing sludge or biomass. This biomass is being evaluated for its potential as a feed ingredient or as a fertilizer. The fiscal year 1986 grant has been awarded, supporting this research through March 31, 1987.

In 1985, feeding trials were initiated utilizing from 6 to 20 percent of biomass in pig and sheep diets. Analysis of samples over an extended period revealed from 30–40 percent ash and a high content of single-cell protein. No inorganic or organic pollutant were found. In 1986, the effect of feeding biomass to reproducing females over multiple generations will be initiated with simultaneous observation of offspring.

In field tests as a fertilizer, biomass appeared to have economic value when applied to land in proximity to the processing plant, especially on acid soils. Further study is needed to appraise the variability in the biomass from different plants and as affected by different processing methods. Value as a fertilizer will be related to transportation costs and must be equated to the price of commercial fertilizer, type of soil, stage of plant growth and other agronomic factors.

COMPETITIVE GRANTS

Mr. TRAXLER. We have had the Competitive Grant Program for some years now. We certainly must have seen some projects completed. I know that Dr. Bentley spoke quite highly of the level of demand for these funds yesterday. Are we at a point at which you can tell us whether or not this approach to research is more effective from an administrative point of view? Please remember that we have never criticized the research itself, but have strongly questioned whether or not competitive grants were any more cost effective than contract grants.

Dr. JORDAN. As in the past when you have discussed contract grants, I assume you are referring to the Special Research Grants Program. The Special Research Grants and the Competitive Research Grants Programs have basic differences. The Special Research Grants address special problem areas that are best addressed by facilitating or expanding the ongoing State-Federal food and agricultural programs. Participation is restricted by law and the emphasis is often on applied problem sovling. The Competitive Research Grants, on the other hand, primarily address basic re-

search needs of agriculture, and eligibility is open to any organization or individual who can put together a winning proposal.

In comparing the administrative requirements of the two approaches, the differences are dictated more by the kind of problem being addressed than by whether it is special or competitive grants. All proposals are peer reviewed and the biggest difference is found between authorizations for State-specific, applied projects and national programs of basic research. The Special Grants Program includes both extremes, while the Competitive Grants Program includes only the latter. We find that both approaches have been effective in serving the needs of agriculture.

HIGHER EDUCATION FELLOWSHIPS

Mr. TRAXLER. Over the past several years we have also talked about the concern that a number of us have about where we will get our research scientists from in the future. You have provided some startling testimony in the past about the fact that one-third of those graduating from our universities with advanced degrees in agriculture were foreign students. What is the current situation? Are more of our young people entering these fields, or are they being scared off by the problems farmers are facing?

Dr. JORDAN. The situation relative to the numbers of non-resident foreign aliens receiving degrees in agriculture remains the same. Approximately one-third of the advanced degrees conferred in agriculture are awarded to foreign students who will be returning to their native country. Less than one percent will remain in this country and be available for domestic employment. At the same time, enrollments are continuing to decline in colleges of agriculture. To some extent, a portion of projected declining enrollments may be attributed to demographic realities. However, between 1977 and 1982, total U.S. college enrollments were continuing to increase while agriculture enrollments were declining. Total U.S. college enrollments did not reflect a decrease until 1983. Hence, demographic changes, such as a diminishing pool of college-age youth, cannot be used solely to rationalize declining enrollments in agricultural fields of study. Demographics will very likely, however, exacerbate the problem in the future in that the U.S. college-age population is projected to diminish 25 percent over the decade. We must recognize that the public image of agriculture as production, combined with increasing competition from other disciplines, is contributing to the reluctance of students to pursue university degrees in the broad array of academic disciplines comprising the food and agricultural sciences. Furthermore, the portrayal of agriculture via the mass media is not currently enhancing our image. The "Farm Problem" is much of what we hear about when agriculture is the subject. This publicity does much to obscure the continuing career opportunities in agriculture.

Mr. TRAXLER. This program took a 40% cut last year which I personally wish could have been avoided. What has been the impact of the reduced level of funding?

Dr. JORDAN. Funds for FY 1986 have not yet been awarded. However, we intend to support the 250 plus doctoral fellows recruited in 1984 who are entering their third and final year of training. Sti-

pends for these doctoral fellows will be reduced from $15,000 to $9,750 as a result of the 40 percent budget reduction.

Mr. TRAXLER. I am sure that students began their programs last fall with the expectation that the fellowship program would continue without real change. Do you have any idea as to whether or not any students were forced to drop out of the program as a result of the cut, or if universities could be facing a liability for fulfilling the terms of the fellowships?

Dr. JORDAN. At this point in time, program funds for FY 1986 have not yet been awarded. Therefore, students enrolled in the program are yet to be officially notified of a 40 percent funding reduction. However, each year in the grant renewal process institutions have been apprised that continued support is "contingent' on the availability of funds for this purpose.

Mr. TRAXLER. One of the reasons for starting this program was that private industry was able to attract the best students by being in a position to help with educational expenses. If this program is terminated, don't we face the real danger that private firms could come in to help a student with the cost for just the last year or two of their programs, and get those young people that we may have been counting on for our future ARS and university scientists?

Dr. JORDAN. We believe this program has been quite successful in attracting outstanding students to pursue degrees in the targeted national need areas. Therefore the number of young people in the pipeline who are pursuing training has been increased for the benefit of all who need new scientists. Unquestionably, competition with the private sector for available graduates will become keener because of continuing imbalances across the supply/demand scenario.

Mr. TRAXLER. Did you request a supplemental appropriation for fiscal 1986 for this program, or would you say that one is needed?

Dr. JORDAN. The U.S. Department of Agriculture has not requested any supplemental appropriations for FY 1986 for Science and Education programs. Because of the need to contain Federal expenditures and thereby reduce the budget deficit this program is not a part of the President's FY 1987 Budget nor is it a candidate for FY 1986 supplemental support.

TROPICAL AND SUBTROPICAL AGRICULTURE

Mr. AKAKA. Dr. Jordan, what are the unique benefits associated with undertaking research on tropical and subtropical species?

Dr. JORDAN. Research with tropical and subtropical species enlarges our nation's research base as well as expands our scientific knowledge base. Research conducted in the United States tropical and subtropical areas assists not only our domestic agriculture but can be used also by farmers in other tropical and subtropical parts of the world.

Mr. AKAKA. Dr. Jordan, what special benefits accrue to species found in regions other than the tropics as a result of research on tropical and subtropical agriculture?

Dr. JORDAN. Some research methodologies developed for tropical and subtropical crops will have application for use on research of

temperate zone crops. Additionally, some research results may be applicable toward solving problems of temperate zone crops.

Mr. AKAKA. Dr. Jordan, list the accomplishments of your program of research on tropical and subtropical agriculture over the past year.

[The information follows:]

Research progress continues to be made in Hawaii and other states on improving disease and insect resistance of corn for tropical conditions; improving the quality of forage for cattle; control of medfly and nematodes; growing Chinese catfish; improving irrigation systems; use of integrated pest management for cabbage and lettuce; control of papaya ringspot; using growth simulation models to predict maximum yields of sugarcane; biological control of weeds; rancidity of macadamia nuts; use of mycorrihizal fungi to increase crop yields; potential for potato production in Guam; increasing the production of winged beans; controlling diseases of pepper; crop models for cassava, corn and papaya; improving tomato production under high temperatures and humidity; controlling virus diseases of taniers; iron and zinc requirements of rice; and finding rice germplasm resistant to insects.

Mr. AKAKA. Dr. Jordan, identify the universities which directly or indirectly participated in tropical and subtropical research over the past year.

Dr. JORDAN. In fiscal year 1985 Special Research Grants were awarded to the University of Hawaii, University of Guam, University of Florida, University of Puerto Rico, College of the Virgin Islands, and Louisiana State University.

EDB REPLACEMENT

Mr. AKAKA. Dr. Jordan, what are the problems in Hawaii and other areas of the U.S. associated with cancellation of agricultural uses for EDB?

Dr. JORDAN. The problem is there are no acceptable alternatives to EDB to satisfy the quarantine requirements for shipments of fruits from fruit fly infested areas to noninfested areas. Treatments must assure that no living fruit fly infestation remains in the fruit after treatment and that fruit quality is not impaired with treatment.

Mr. AKAKA. Dr. Jordan what are the research objectives of the EDB replacement special research grant?

Dr. JORDAN. The objectives of the research are to examine alternative mechanisms to disinfest papayas and other fruit of fruit flies, prevent infestation by fruit flies, assure fruit quality and shelf life in the market place after treatment, and control postharvest diseases.

Mr. AKAKA. Dr. Jordan, what activities were undertaken through this special research grant in FY 1986?

Dr. JORDAN. Scientists at the Hawaii Agricultural Experiment Station have been examining various alternative mechanisms to disinfest papayas of fruit flies and meet the requirements for maintaining fruit quality and shelf life in the market place. In addition, they are developing means to assess the quantity and causes of fruit losses during postharvest handling, transportation, marketing and consumption. Information transfer is playing an important role in this project and assures the adoption of improved practices as well as research efficiency.

Mr. AKAKA. Dr. Jordan, what amounts were made available for this research initiative in FY 1986 and what amounts are contained in the FY 1987 request?

Dr. JORDAN. A grant has been awarded from funds appropriated in FY 1986 of $298,000 or $285,000 under Gramm-Rudman-Hollings. In fiscal year 1987, no funding is requested for this research under the Special Research Grants program.

AQUACULTURE SPECIAL RESEARCH GRANT

Mr. AKAKA. Dr. Jordan, how many applications have you received for funding under the aquaculture special research grant in each of the past three fiscal years? Of these, how many grants were awarded and what was the average award amount?

Dr. JORDAN. Aquaculture proposals submitted and grants awarded in fiscal years 1983, 1984, and 1985 will be submitted for the record. The average amount of the aquaculture grants was approximately $68,100.

[The information follows:]

	Number of proposals submitted	Annual request	Number of grants awarded	Amount of awards
FY 1985	77	$5,495,102	7	$497,435
FY 1984	69	4,482,281	7	499,445
FY 1983	72	4,551,843	8	501,455

Mr. AKAKA. Dr. Jordan, identify some of the worthwhile research proposals which have been rejected.

[The information follows:]

Based upon the scores ascribed to the proposals by the peer panel in 1985, titles of the five proposals just under the funding level were as follows:

Production of fish chimeras using previously frozen cells; effects of aeration and water circulation on water quality, disease and yield of crawfish ponds; nutrition and environmental requirements of red drum; genetic engineering of catfish by microinjection; search for aquatic fungicides to replace malachite green.

AQUACULTURE PLANNING IN HAWAII

Mr. AKAKA. Dr. Jordan, what are the objectives of the special research grant for aquaculture planning in Hawaii?

Dr. JORDAN. Meetings are now taking place to firm up the objectives and procedures for this planning grant. As now viewed, the current status of aquaculture in Hawaii will be carefully examined with recommended areas for further development. The effort will identify and evaluate the potential of all important aquaculture species and determine the present state of their commercial development. In a broader view, aquaculture expansion in all U.S. Pacific territories will be examined to try and define a tropical aquaculture for Hawaii as well as this greater Pacific area. In addition to a complete literature survey, the potential of marine biotechnology to further aquaculture development will also be examined.

Mr. AKAKA. Dr. Jordan, identify the research institutions and the public and private agencies which participate in the Hawaii Statewide Aquaculture Coordinating Committee Planning.

Dr. JORDAN. The participants in this effort are referred to as the "Ad-hoc Aquaculture Group" and consist of the Hawaii Institute of Marine Biology, the University of Hawaii Sea Grant College Pro-

gram, the College of Tropical Agriculture and Human Resources, the Aquaculture Development Program of the State Department of Land and Natural Resources and the Oceanic Institute.

Mr. AKAKA. Dr. Jordan, to what extent can aquaculture planning of this nature avoid duplication of effort and encourage public and private institutions to address the highest priority issues affecting aquaculture development?

Dr. JORDAN. Effective planning of this kind should be able to identify the opportunities and constraints, given the resources available in Hawaii, to greatly aid in the orderly development of the aquaculture potential of the State. For this to become a reality, there will need to be close cooperation and coordination between the institutions involved as well as with private industry. Only by such coordination can duplication of effort be avoided. As the highest priority areas are identified, the planning effort should include the necessary longer-term follow-up needed for economically sound development of the selected industries.

SHRIMP RESEARCH

Mr. AKAKA. Dr. Jordan, what is the current trade deficit in fish products and how much of this amount is represented by a trade deficit in shrimp?

Dr. JORDAN. The value of fish and shellfish imported into the U.S. in 1984 was $5.9 billion with exports of approximately $1.0 billion, leaving a trade deficit of $4.9 billion. The value of shrimp imports in 1984 was $1.216 billion with exports of $44 million. Therefore, approximately 21% of total import of fish products is represented by shrimp and there was a trade deficit in shrimp of $1.172 billion.

Mr. AKAKA. Dr. Jordan, what would be the benefits of expanded U.S. production of shrimp through aquaculture?

Dr. JORDAN. If methods of production can be developed which are adapted to U.S. conditions and the U.S. producer can be competitive economically with the price of imported shrimp, there is real potential for such an industry. This would not only decrease U.S. dependence on imported shrimp but would also provide an opportunity, particularly in our southern coastal areas, for another profitable food production enterprise.

Mr. AKAKA. Dr. Jordan, what are the research objectives of the Gulf Coast shrimp research project?

Dr. JORDAN. The overall objective of this program is to accelerate the development of a U.S. marine shrimp farming industry through the identification and resolution of the key constraints.

Industry expansion will hinge on cost reduction and increased revenue by a more readily available supply of disease—free broodstock and finally the methodology to prevent and treat disease under commercial conditions.

Mr. AKAKA. Dr. Jordan, what amounts were made available for this research initiative in FY 1986 and what amounts are contained in the FY 1987 request?

Dr. JORDAN. In fiscal year 1986, $1,292,000, or $1,236,000 under Gramm-Rudman-Hollings, has been appropriated for the Gulf

Coast shrimp aquaculture research program. No funding is requested for this project in fiscal year 1987.

CROPS FOR CRITICAL INDUSTRIAL MATERIALS

Mr. AKAKA. Dr. Jordan, to what extent is CSRS engaged in research or demonstration on any of the following crops which may be of strategic value-Identify the nature of the research by crop, and state the amount expended or planned to be expended for each crop by fiscal year.

I. Long chain fatty acid crops—used for the production of lubricants, plasticizers, slip agents and foam suppressants.

(a) Crambe spp. (Cruciferae—mustard family); (b) Meadow Foam (Limnanthes spp.) native to northern California; (c) Honesty—Lunaria annua L. (Cruciferae—mustard family); and (d) Rapeseed—Brassica spp. (Cruciferae—mustard family).

II. Medium chain fatty acid crops—used for soap and detergent manufacturing.

(a) Cuphea spp. (Lythraceae)—of South American origin and also found in Mexico and southern U.S.

III. Hydroxy fatty acid crops—castor oil products.

(a) Lesquerella spp.—found in south central U.S. and northern Mexico in dry areas.

IV. Epoxy fatty acid crops—used for coatings and adhesives. Currently manufactured from petrochemicals, linseed and soybean oil.

(a) Ironweed—Vernonia spp. (Compositae—daisy family); and (b) Stokes aster—Stokesia spp. (Compositae—daisy family)

V. Liquid wax esters—used for high performance lubricants, cosmetics and other finished products.

(a) Jojoba—Simmondsia chinensis—grown in dryland areas.

VI. Vegetable oils for energy crops.

(a) Chinese tallow tree—Sapium sebiferum (Euphorbiaceae) Used commercially in Asia for the drying properties like linseed oil.

Dr. JORDAN. Over the years, research has shown that a number of non-food crops have significant economic value for industrial applications. Just as USDA has conducted research on guayule for domestic rubber production, resources are to be applied to plant extracts that can replace petroleum-based chemicals and extracts.

The crops and their potential products are known; however, it must be kept in mind that the strategic material they will replace currently commands the market. The work proposed for FY 1987 concerning these crops represents demonstration or development efforts to assist the introduction of these crops into a commercial market.

This work represents an effort to provide the farmer an alternative source of income as well as to introduce a farm-produced product to help support the Nation's industrial base. The following crops represent USDA efforts to address agricultural products of a strategic or critical nature.

For Kenaf, a FY 1986 demonstration project is underway. In a $100,000 cooperative agreement between USDA and Kenaf International, paper and pulp mill markets for the Kenaf fiber in Texas, Arizona, Georgia, Arkansas, Lousiana, and Mississippi are being explored. When mills agree to use Kenaf for newsprint and paper

product manufacturing, farm sector arrangements will be made to produce Kenaf in the vicinity of participating mills. Resources are available to defray some risks in introducing a new fiber into the mill's raw material base. In addition, $7,000 of Hatch Act funds are used to conduct Kenaf research.

Work is proceeding on the long chain fatty acid crops of Crambe, Meadowfoam, and Winter Rapeseed. These crops are used for the production of lubricants, plasticizers, slip agents and foam suppressants.

For Crambe, research is underway on agronomics, variety improvement, improving production processes, increasing seed oil yields, and the potential of crambe as a fuel oil. Amount expended is $36,034.

For Meadowfoam, research is proceeding on improving germplasm, chemical analysis of fatty acids, agronomics, and weed control. Amount expended is $7,466.

For Lunaria, currently no research dollars are being applied. The crop will take several years for development, and resources are being placed in higher priority areas.

For Winter Rapeseed, areas of research are on the development of alternative energy sources, improving cultivation and adaptation, crop rotation, genetics, and increasing oil yield. Amount expended is $160,333.

Another category of research involves the medium chain fatty acid crops, which are used for soap and detergent manufacturing, and includes Cuphea. Research centers on agronomics, chemical analysis of fatty acids, genetics directed towards increased yields and disease resistance, and physiological studies. Amount expended is $16,903.

Hydroxy fatty acid crops, which produce castor oil products, is a category including Lesquerella. Research, amounting to $4,383, is underway evaluating the potential of developing Lesquerella as a new, alternative crop.

Vernonia and Stokes Aster are epoxy fatty acid crops, used for coatings and adhesives and currently manufactured from petrochemicals, linseed and soybean oil. For the crops Stokes Aster and Vernonia, no current research dollars are being applied. These crops will take several years for development, and resources are being applied in higher priority areas.

Jojoba is a crop composed of liquid wax esters and used for high performance lubricants, cosmetics and other finished products. Research is centered on genetics, production and management, irrigation, and disease and insect control. Amount expended is $100,859.

Chinese tallow tree, which produces a vegetable oil, is suitable as a wood fuel/chemical crop. As in the case of Lunaria and Vernonia, no research dollars are currently being applied.

For Guayule, a domesticate, the emphasis to develop a domestic natural rubber industry continues under the Critical Agricultural Materials Act of 1984, PL 98-284. The natural rubber program is a cooperative effort with the States of Arizona, California, Texas and New Mexico in the agronomic aspects of guayule production and processing technology for rubber extraction and by-product enhancement. In the fiscal year 1985, funds available for this program were $702,000 from CSRS. In addition, $55,000 of Hatch Act

funds are being used to conduct research on guayule. USDA is exploring the feasibilty of providing assistance to the Department of Defense in the management of an Arizona-based project of guayule production with the Gila River Indian Community and the development of a prototype processing facility to be operated by the Firestone Tire and Rubber Company, a program cooperator.

RESEARCH ON TREE CROPS AND WOOD BYPRODUCTS

Mr. AKAKA. Dr. Jordan, to what extent is CSRS engaged in research or demonstration on any other crops which may be of strategic value (Identify the nature of the research by crop, and state the amount expended or planned expenditures by fiscal year).

Dr. JORDAN. Existing and emerging technologies enable a broad range of new products to be manufactured from currently underutilized hardwood species and from waste wood material. New products with strategic value include fuels, molded fiber and structural materials, and chemicals.

Current research emphasizes the production of energy and chemicals from forest resources. Specific studies are underway on the utilization of forest-product residuals, gasification of woody biomass, and the extraction of wood turpentine and other chemicals. Amount expended on tree crops and wood byproducts totals $283,565.

SUGARLAND USE RESEARCH

Mr. AKAKA. Dr. Jordan, what are the research objectives of the sugarland use special research project?

Dr. JORDAN. The research objectives of the sugarland use special research project are to develop a computerized data base containing soil, climate, crop and crop economic information; develop methods to determine new or alternative crops based on economic data for Hawaii; and to develop models to extrapolate crop inputs and yield data from one site to another.

Mr. AKAKA. Dr. Jordan, how many acres have been taken out of sugar production in Hawaii since January 1, 1980? How much does this acreage represent compared to the total cane acreage in production in Hawaii in 1980?

Dr. JORDAN. Since January 1, 1980, thirty thousand acres have been taken out of sugar production. This represents fourteen per cent of the 218,000 acres of sugarcane then grown.

Mr. AKAKA. Dr. Jordan, what work has been completed to date and what work remains to be completed on the sugarland use project?

Dr. JORDAN. The natural land data base is almost complete and it provides detailed land, soil and environmental data for the entire state in twenty acre segments. The economic screening methodolgy has been defined and is being tested on several indicator crops to validate the yield prediction model. After this methodology is proven then the 1,100 potential crops for Hawaii can be screened down to thirty or less crops for which actual field production testing would be desirable. This methodology will allow decision makers to vary conditions and assumptions, thereby narrowing the selection of crops and growing locations for which expensive and

time consuming field testing is necessary. Research proposed under the objectives of the current projects will be completed. As the results of this research become known, as assessment can be made of the need for augmenting the base of scientific knowledge developed by this program.

Mr. AKAKA. Dr. Jordan, how will idle sugarcane acreage and underutilized agricultural land in Hawaii benefit from this research?

Dr. JORDAN. This research, involving crops modeling, and the development of extensive data bases of Hawaii environmental and soil factors will enable the preselection of crops having a high probability of producing profitable crops on land now growing sugarcane. The system can then be tested by actually growing the promising, alternate crops and measuring their performance in yield, quality, marketability and profitability.

Mr. AKAKA. Dr. Jordan, what amounts would be required to complete sugarland use research in FY 1987? What amounts are contained in the budget request for these activities?

Dr. JORDAN. In 1982 the Hawaii State Agricultural Experiment Station developed a proposal for the use of agriculture land in Hawaii that would take five years to complete and would require $150,000 funding each year. In fiscal years 1983, 1984, and 1985, $150,000 was appropriated and in fiscal year 1986, $149,000 has been appropriated or $142,000 under Gramm-Rudman-Hollings. No funding is requested for this grant in fiscal year 1987.

Mr. WHITTEN. Mr. Watkins.

Mr. WATKINS. I am most disappointed that the President's budget did not include funding for special grants. In addition, the budget is proposing to slice other research functions. The day we stop research is the day we stop progressing. That growth in knowledge for the future must be constant, lest the past catches up with us and we don't have the answers to many of our problems. I won't belabor the point of how I feel about the proposed reductions.

SOUTH CENTRAL RESEARCH CENTER

I have watched over the past year as research activities have progressed at the South Central Research Center at Lane. What is the status of the working relationship between CSRS, ARS, and Oklahoma State University at Lane and related satellites?

Dr. JORDAN. The present relationship between CSRS, ARS, and Oklahoma State University at the South Central Research Center at Lane is excellent. Each of these agencies are cooperating fully within the limitations of their individual missions.

Mr. WATKINS. Is there anything that needs to be done to enhance this relationship?

Dr. JORDAN. The relationship is excellent, and we cannot suggest any action that will enhance it.

Mr. WATKINS. What crops are being grown or proposed to be grown at Lane? At other satellites?

Dr. JORDAN. A variety of fruits including peaches, strawberries, blueberries, and brambles, various vegetables, and a number of

pecan cultivars are planned for the Center at Lane and other satellites.

Mr. WATKINS. How many CSRS scientists are on site and how many are proposed to occupy the Center after construction is completed on Phase II?

Dr. JORDAN. Funding from CSRS, through the Hatch formula program, helps to support the Oklahoma State University scientists on their staff. Currrently, three Oklahoma State University scientists are at the center and a total of seven are planned. The present Superintendent is on the Oklahoma State University faculty. There are presently two ARS scientists there. A total of eighteen ARS scientists are proposed.

Mr. WATKINS. Last year funding was provided by the committee for research in the area of preservation and processing at Lane?

Dr. JORDAN. The CSRS budget included a special research grant of $149,000 for this research which was awarded to Oklahoma State University.

Mr. WATKINS. What is the status of this research and what departments at OSU will be involved in carrying out this project?

Dr. JORDAN. A study has been initiated to review the current structure of the vegetable processing industry in the South Central region of the U.S. and to determine whether existing processing plants are planning to make changes in their processing capacity. The best product mixes are being studied. The project incorporates cost simulation studies of various types of processing plants and the cost per unit these processing plants can pay farmers for their vegetables which will enable farmers to make a profit. The Department of Agricultural Economics, Horticulture and Landscape Architecture, Plant Pathology, and the College of Home Economics at Oklahoma State University are involved in carrying out this project.

Mr. WATKINS. What is the role of each entity involved?

Dr. JORDAN. The Agricultural Economics Department will provide information about the economics of preservation and processing of crops produced in the area. The Horticulture and Landscape Architecture Department will conduct research on the optimal cultural methods for growth of crops produced for preservation and processing. The Department of Plant Pathology will determine the most disease resistant cultivars produced for processing and preservation. The College of Home Economics will conduct research on processing and preserving horticultural crops.

Mr. WATKINS. What are the CSRS' long range goals for research scientists at Lane?

Dr. JORDAN. The research to be conducted under the special research grants awarded will be completed. Oklahoma State University may continue to conduct production research on horticultural crops in Southeastern Oklahoma using funds provided through other CSRS formula funded programs and from the State of Oklahoma.

Mr. WATKINS. Do studies and recommendations continue to reflect the need for more work in the area of preservation and processing?

Dr. JORDAN. Yes. Additional production and preservation research on horticultural crop cultivars adapted to the area are needed.

Mr. WATKINS. Is CSRS currently conducting research on food irradiation?

Dr. JORDAN. There is no food irradiation research being conducted by Oklahoma State University utilizing CSRS funds, at the South Central Research Center. There is, however, irradiation research being carried on at several other State Agricultural Experiment Stations utilizing funds provided through CSRS and the various State Legislatures.

Mr. WATKINS. Is food irradiation a recognized area for further research by CSRS?

Dr. JORDAN. Food irradiation is a recognized area for further research. This research can be done by utilizing Hatch formula funds available to State Agricultural Experiment Stations from CSRS if the Directors determine that this research is a high priority area. Information is needed on labeling of foods preserved by irradiation, consumer acceptance, and the inability to preserve certain foods satisfactorily by other means of preservation.

Mr. WATKINS. What plans do you have for conducting research in food irradiation?

Dr. JORDAN. Plans are being made to study preservation of certain foods by irradiation at the South Central Research Center when facilities and staffing become available.

Mr. WATKINS. Does food irradiation research fit into the plan of preservation and processing research at Lane?

Dr. JORDAN. Yes. This appears to be an excellent way to preserve horticultural food crops raised in Southeastern Oklahoma.

Mr. WATKINS. What are the long range plans of CSRS in all areas of food processing and preservation research?

Dr. JORDAN. Food processing and preservation research is needed with a number of horticultural commodities. CSRS Hatch formula program funds can be used to carry out this research if the Directors of the State Agricultural Experiment Stations direct their funds for such research.

Mr. WATKINS. Also, this committee provided funding for studies in integrated production systems in Oklahoma. What is the status of this project?

Dr. JORDAN. An orchard/vegetable intercropping system for small farms in Southeastern Oklahoma has been initiated. This has included a study of the impact of alternative orchard and strawberry and vegetable intercropping systems on farm income, income variability, short-run and long-run cash flow, resource requirements, and the optimal use of farm family resources. Peach orchard/vegetable and peach orchard/strawberry intercropping recommendations are being developed.

Mr. WATKINS. Will this level of funding be adequate to continue the project next year?

Dr. JORDAN. Research under the objectives of the current research projects will be completed. As research accomplishments become known, an assessment can be made of the need for augmenting the base of scientific knowledge developed by the program.

COMPETITIVE RESEARCH GRANTS

Mr. WATKINS. What is the status of CSRS competitive grants in the nation? How many were awarded last year at the FY 85 level of funding?

Dr. JORDAN. Since the Competitive Research Grants Program began in fiscal year 1978, a total of 8,056 proposals have been submitted requesting $1.5 billion and the agency has been able to award 1,902 grants totaling $152 million. This response from the research community indicates the great amount of interest in the program and that it plays an important role in the research arena. That role is to complement the formula programs by obtaining the participation of scientists throughout the country with the expertise to contribute to the selected areas of research. This program can help focus research expertise and attention on selected areas of science of major importance to our long-term food & agricultural interests. In fiscal year 1985, 449 Competitive Research Grants were awarded.

Mr. WATKINS. Could you provide for the record the research done in the area of competitive grants?

[The information follows:]

RESEARCH GRANTS AWARDED IN FISCAL YEAR 1985

	Grants awarded	Dollars awarded
Plant biology:		
Biological stress	60	$4,181,544
Genetic mechanisms	44	3,860,000
Nitrogen fixation	40	3,060,000
Photosynthesis	40	3,060,000
Soybeans	7	497,435
Acid precipitation	11	667,409
Alcohol fuels	6	518,562
Subtotal	208	15,844,950
Human nutrition:		
Nutrient requirements	28	1,920,600
Animal science:		
Brucellosis	3	480,150
Reproductive efficiency	13	2,400,750
Reproduction physiology	8	1,440,450
Subtotal	24	4,321,350
Biotechnology:		
Plant growth and development	25	2,225,000
Plant molecular biology	31	4,100,000
Responses to biological stress	30	3,100,000
Responses to Environmental Stress	17	2,000,000
Animal growth and development	26	3,400,000
Animal molecular biology	37	4,381,000
Subtotal	166	19,206,000
Pest Science:		
Gypsy Moths	7	960,300
Boll Weevil/Bollworm	9	960,300
Pine Bark Beetle	7	960,300
Subtotal	23	2,880,900
Total	449	44,173,800

Mr. WATKINS. Is this amount provided by the committee adequate to conduct the program and research needed?

Dr. JORDAN. In the interest of keeping Federal spending within certain limits, we believe that the funding level recommended this year is appropriate for the important areas of research included under the Competitive Research Grants Program.

BRUCELLOSIS RESEARCH

Mr. WATKINS. Could you elaborate on other brucellosis research activities being conducted in CSRS other than under competitive research grants?

Dr. JORDAN. Brucellosis research is being supported extramurally through funds appropriated to Cooperative State Research Service under several authorizations. These include, in addition to the Animal Science Competitive Research Grant Program, the broad-based formula program for agricultural research under the Hatch Act; the Animal Health and Disease Research formula program, Section 1433, P.L. 95-113; and Special Research Grants for Animal Health, P.L. 89-106.

Under the Hatch Act funds, brucellosis research is being conducted in Alabama, California, Florida, Louisiana, Massachusetts, Michigan, New York, Texas, Virginia, and Wyoming. Research studies in most of these states is centered on improved methods for the diagnosis and detection of brucellosis, further clarification of immune mechanisms that produce resistance to the disease and the development of new vaccines or potentiation of existing vaccines or vaccination methods. Brucellosis is the most important cause of epididymitis in sheep and some studies are being directed toward control of this problem in sheep.

Research under the Animal Health and Disease formula program—section 1433 is being carried out in Alabama, Alaska, California, Florida, Missouri, New York, Texas, and Virginia. Research is centered in these primary areas: development and evaluation of improved diagnostic methods, studies on the basic mechanisms of animal resistance to brucella infection, and the epidemiology of the disease. Brucellosis is an important problem in Alaskan reindeer, and Alaska is studying the effect of vaccination on the control of brucellosis infection in reindeer. The role of hormones in the pathogenesis of brucellosis and the safety of embryo transfer from brucella infected donor cows are being investigated.

In the Animal Health Special Research Grants program two grant awards were made in FY 1985. These grants were made to Iowa and Texas and the research is directed towards studying the basic mechanisms of the animals' resistance to brucella infection.

Proposals for additional research on brucellosis are being considered under the FY 1986 Special Research Grant Program in

Animal Health and the Competitive Research Grant Programs in Biotechnology and Animal Science. We expect that the selection of proposals to be funded will be completed by June.

Mr. WATKINS. How much of the funding for animal health and disease research is dedicated to brucellosis?

Dr. JORDAN. In fiscal year 1985, total CSRS funding for animal health and disease research was $21 million, of which approximately $1.1 million was related to brucellosis research.

Mr. WATKINS. Are further funds needed in this area to conduct the adequate research needed in brucellosis?

Dr. JORDAN. The fiscal year 1986 budget would provide approximately $1 million for brucellosis research under CSRS programs. The highest priorities of brucellosis research are being addressed with this level of funding.

NATIONAL NEEDS GRADUATE FELLOWSHIP PROGRAM

Mr. WATKINS. This program is attracting and retaining quality young people in the field of agriculture. It is critical to retain quality people for the future of agriculture. I was disappointed to see your budget cut out funding for the third year of the three-year graduate program. At OSU, six fellowships were awarded in the area of Agricultural Marketing and International Trade. This program is working hand-in-glove with the development of rural communities in the state. How many young people participated in this program last year?

Dr. JORDAN. Some 302 graduate fellows were supported during FY 1984 and FY 1985. Since Master's fellows were only eligible for support for two years, FY 1986 funds are being used to support the third year of study for some 259 doctoral fellows in the program.

Mr. WATKINS. What is the quality of these individuals?

Dr. JORDAN. We are extremely pleased with the quality of the students recruited. We are finding that this program is quite successful in attracting academically outstanding young students to graduate studies in the targeted national needs areas.

Average Graduate Record Examination scores for doctoral fellows are as follows:

Biotechnology	1,394
Food science and human nutrition	1,294
Agricultural marketing	1,265
Agricultural engineering	1,235
For Master's fellows:	
Agricultural engineering	1,420
Food science	1,211

The national average GRE score for all graduate students in agriculture is 969; for biological sciences—1081. The difference in the overall national average and that of the USDA fellows is indicative of the high quality students the program has served to attract.

Mr. WATKINS. What impact do you see these individuals having on the future of agriculture?

Dr. JORDAN. Assuring the Nation of a continuing supply of outstanding food and agricultural scientists and professionals is critically important to the future success of American agriculture. This initial class of fellows trained via the National Needs Fellowship program will soon graduate. It is fully expected that they will vig-

orously pursue careers which will afford them significant opportunities to advance U.S. science and education in the critical areas of biotechnology, agricultural marketing, agricultural engineering and water management, food science and human nutrition.

Mr. WATKINS. How critical is this program to the future of agriculture?

Dr. JORDAN. Agricultural expertise is a basic national resource and is critically important to the security and well-being of this country. The United States cannot continue as the lead nation in agriculture without adequate development of human capital, the ultimate resource in American agriculture.

Mr. WHITTEN. Thank you, Dr. Jordan.

COOPERATIVE STATE RESEARCH SERVICE

Purpose Statement

Cooperative State Research Service is the U.S. Department of Agriculture's principal entree to the university system of the United States for the purpose of conducting agricultural research as authorized by the Hatch Act of 1887, as amended (7 U.S.C. 361a-361i); the Cooperative Forestry Research Act of 1962, as amended (16 U.S.C. 582a-7); Public Law 89-106, Section (2), as amended (7 U.S.C. 450i); and the National Agricultural Research, Extension, and Teaching Policy Act of 1977, as amended (7 U.S.C. 3101 et seq.). Through these authorities, the U.S. Department of Agriculture participates with State and other sources of funding to encourage and assist the State institutions in the conduct of agricultural research through the State Agricultural Experiment Stations of the 50 States and the territories; by approved Schools of Forestry; the 1890 Land-Grant Institutions and Tuskegee University; Colleges of Veterinary Medicine; and other eligible institutions.

Cooperative State Research Service participates in a nationwide system of agricultural research program planning and coordination among the State institutions, U.S. Department of Agriculture and the agricultural industry of America. Program coordination and planning are carried out by a Cooperative State Research Service staff located entirely in the Washington, D.C. area. This headquarters unit serves more than 12,000 scientists in the university system of the United States. As of September 30, 1985, there were 130 full-time employees and 21 other than full-time employees.

COOPERATIVE STATE RESEARCH SERVICE

Available Funds and Staff-Years

1985 Actual and Estimated, 1986 and 1987

Item	1985 Actual		1986 Estimated		1987 Estimated	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Cooperative State Research Service	$307,093,000	131	$291,457,000	135	$246,356,000	135
Obligations under other USDA appropriations:						
Agricultural Research Service:						
Share of Office of Grants and Program Systems	620,062	- -	620,062	- -	620,062	- -
Human Nutrition Research & Information Service (HNRIS)	18,750	- -	18,750	- -	18,750	- -
National Pesticide Information Retrieval System	12,500	- -	- -	- -	- -	- -
International Food Legume Research Conference	1,500	- -	3,500	- -	3,500	- -
International Plant Molecule Biology Conference	- -	- -	5,000	- -	- -	- -
Evaluation studies	478,975	- -	475,000	- -	475,000	- -
Extension Service, Share of Office of Grants and Program Systems	121,900	- -	121,900	- -	121,900	- -
National Agricultural Library:						
Share of Office of Grants and Program Systems	18,800	- -	18,800	- -	18,800	- -
Conference for Land-Grant & USDA Field Librarians	3,500	- -	- -	- -	- -	- -
Animal and Plant Health Inspection Service, National Pesticide Information Retrieval System	12,500	- -	- -	- -	- -	- -
Various agencies sharing cost of USDA Small Business Innovation Research Program (SBIR)	375,880	- -	317,213	- -	224,375	- -
Various research agencies sharing cost of Current Research Information System (CRIS)	491,000	5	481,000	5	505,000	5
Total, Other USDA Appropriations	2,155,367	5	2,061,225	5	1,987,387	5
Total, Agriculture Appropriations	309,248,367	136	293,518,225	140	248,343,387	140
Other Federal Funds:						
AID-PASA, Nitrogen fixation	459,644	- -	700,000	- -	500,000	- -
AID-PASA, International Research Centers	- -	- -	400,000	- -	900,000	- -
Forest Service:						
Forest research	162,000	- -	- -	- -	- -	- -
Atmospheric deposition	22,000	- -	22,000	- -	22,000	- -
National Pesticide Information Retrieval System	50,000	- -	- -	- -	- -	- -
Department of Interior-Geological Survey, Atmospheric deposition	142,000	- -	142,000	- -	142,000	- -
National Institute of Mental Health, Urban Followup Study	10,000	- -	- -	- -	- -	- -
Environmental Protection Agency, Biotechnology Activities	10,000	- -	- -	- -	- -	- -
Food and Drug Administration, Nutritional improvements in the food supply	- -	- -	100,000	- -	- -	- -
Department of Commerce-NOAA, precipitation monitoring network	- -	- -	13,000	- -	- -	- -
Miscellaneous reimbursements	- -	- -	221,275	- -	296,113	- -
Total, Other Federal Funds	855,644	- -	1,598,275	- -	1,860,113	- -

Item	1985 Actual Amount	1985 Actual Staff Years	1986 Estimated Amount	1986 Estimated Staff Years	1987 Estimated Amount	1987 Estimated Staff Years
Non-Federal Funds:						
State Agricultural Experiment Stations and 1890 Institutions, Sharing cost of Current Research Information System (CRIS)	245,500	3	240,500	3	252,500	3
Total, Cooperative State Research Service	310,349,511	139	295,357,000	143	250,456,000	143

	1985 Actual	1986 Estimated	1987 Estimated
Full-Time Equivalent Staff-Years:			
Ceiling	136	140	140
Non-ceiling	3	3	3
Total	139	143	143

COOPERATIVE STATE RESEARCH SERVICE

CLASSIFICATION BY OBJECTS

1985 and Estimated 1986 and 1987

	1985	1986	1987
Personnel Compensation:			
Headquarters	$4,707,898	$4,956,000	$4,956,000
Field	- -	- -	- -
11 Total Personnel Compensation	4,707,898	4,956,000	4,956,000
12 Personnel Benefits	514,685	540,000	540,000
13 Benefits for former personnel	1,887	2,000	2,000
Total Pers. Comp. & Benefits	5,224,470	5,498,000	5,498,000
Other Objects:			
21 Travel	479,609	673,000	628,000
22 Transportation of things	36,738	39,000	39,000
23.3 Communications, utilities and miscellaneous charges	738,343	779,000	779,000
24 Printing and reproduction	61,593	68,000	68,000
25 Other services	2,069,838	2,505,000	754,000
26 Supplies and materials	156,114	170,000	170,000
31 Equipment	317,690	344,000	344,000
41 Grants, subsidies and contributions	295,035,587	281,381,000	238,076,000
Total other objects	298,895,512	285,959,000	240,858,000
Total direct obligations	304,119,982	291,457,000	246,356,000
Position Data:			
Average Salary, ES positions	$69,150	$70,050	$70,050
Average Salary, GS positions	32,489	32,489	32,489
Average Grade, GS positions	9.52	9.52	9.52

COOPERATIVE STATE RESEARCH SERVICE

Permanent Positions by Grade and Staff-Year Summary

1985 and Estimated 1986 and 1987

Grade	1985 Headquarters	1986 Headquarters	1987 Headquarters
ES-6	- -	1	1
ES-5	1	1	1
ES-4	3	2	2
GS-16	1	1	1
GS/GM-15	28	28	28
GS/GM-14	12	12	12
GS/GM-13	8	8	8
GS-12	9	9	9
GS-11	10	10	10
GS-9	13	13	13
GS-8	2	2	2
GS-7	15	15	15
GS-6	24	24	24
GS-5	16	16	16
GS-4	10	10	10
GS-3	3	3	3
Other Graded Positions	- -	- -	- -
Ungraded Positions	- -	- -	- -
Total Permanent Positions	155	155	155
Staff-Years:			
Ceiling	136	140	140
Non-Ceiling	3	3	3
Total	139	143	143

COOPERATIVE STATE RESEARCH SERVICE

The estimates include appropriation language for this item as follows (new language underscored; deleted matter enclosed in brackets):

Cooperative State Research Service:

For payments to agricultural experiment stations, for cooperative forestry and other research, for facilities, and for other expenses, including $155,545,000 to carry into effect the provisions of the Hatch Act, approved March 2, 1887, as amended by the Act approved August 11, 1955 (7 U.S.C. 361a-361i), and further amended by Public Law 92-318 approved June 23, 1972, and further amended by Public Law 93-471 approved October 26, 1974, including administration by the United States Department of Agriculture, and penalty mail costs of agricultural experiment stations under section 6 of the Hatch Act of 1887, as amended, and payments under section 1361(c) of the Act of October 3, 1980 (7 U.S.C. 301n.); $12,975,000 for grants for cooperative forestry research under the Act approved October 10, 1962 (16 U.S.C. 582a--582a-7), as amended by Public Law 92-318 approved June 23, 1972, including administrative expenses, and payments under section 1361(c) of the Act of October 3, 1980 (7 U.S.C. 301n.); $23,333,000 for payments to the 1890 land-grant colleges, including Tuskegee [Institute] University, for research under section 1445 of the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (Public Law 95-113), as amended, including administration by the United States Department of Agriculture, and penalty mail costs of the 1890 land-grant colleges, including Tuskegee [Institute] University; [$28,632,000 for contracts and grants for agricultural research under the Act of August 4, 1965, as amended (7 U.S.C. 450i); $44,233,000] $42,425,000 for competitive research grants, including administrative expenses; [$5,725,000 for the support of animal health and disease programs authorized by section 1433 of Public Law 95-113, including administrative expenses; $1,195,000 for research authorized by the Critical Agricultural Materials Act of 1984; $497,000 for rangeland research grants as authorized by subtitle M of the National Agricultural Research, Extension, and Teaching Policy Act of 1977, as amended;] $9,940,000 for grants to upgrade 1890 land-grant college research facilities as authorized by section 1433 of Public Law 97-98, to remain available until expended; [$4,970,000] $1,988,000 for higher education strengthening grants under section 1417(a)(2)(A) of Public Law 95-113, as amended (7 U.S.C. 3152(a)(2)(A)); and [$1,635,000] $150,000 for necessary expenses of Cooperative State Research Service activities, including administration of payments to State agricultural experiment stations, funds for employment pursuant to the second sentence of section 706(a) of the Organic Act of 1944 (7 U.S.C. 2225), and not to exceed [$100,000] $150,000 for employment under 5 U.S.C. 3109; in all, [288,680,000] 246,356,000. Provided, That no funds shall be available in fiscal year 1987 for payments under the Act of August 30, 1890 and the tenth and eleventh paragraphs under the heading "Emergency appropriations." of the Act of March 4, 1907 (7 U.S.C. 321 et seq.).

The first change deletes language for contracts and grants for agricultural research. No funding is proposed for the Special Research Grants program in fiscal year 1987.

The second change deletes language for animal health and disease research program authorized by section 1433 of Public Law 95-113, research authorized by the Critical Agricultural Materials Act of 1984, and for rangeland research grants as authorized by subtitle M of Public Law 95-113, as amended. No funding is proposed for these programs in fiscal year 1987.

The third change would provide an additional $50,000 for employment under 5 U.S.C. 3109. These funds will provide consultation support to the Competitive Research Grants program in OGPS, which funds basic research in selected high priority areas by obtaining the participation of research scientists throughout the entire U.S. scientific community.

The fourth change would provide language to override the Morrill-Nelson Permanent Appropriation. No funding is proposed for this program in fiscal year 1987. Higher education in the food and agricultural sciences at land-grant institutions has been supported through a permanent appropriation in the Second Morrill Act of 1890.

COOPERATIVE STATE RESEARCH SERVICE

Appropriations Act, 1986		$293,223,000
Budget Estimate, 1987		246,356,000
Decrease in Appropriation		-46,867,000
Adjustments in 1986:		
Appropriations Act, 1986	$293,223,000	
Less Pro-Rata Reduction, P.L. 99-190	-1,743,000	
Net Appropriations	291,480,000	
Transfer to Departmental Administration and Office of Governmental and Public Affairs for Reimbursable Activities a/	-23,000	
Adjusted base for 1986		291,457,000
Budget Estimate, 1987		246,356,000
Decrease from adjusted 1986		-45,101,000

a/ A transfer of $6,000 to Departmental Administration and $17,000 to Office of Governmental and Public Affairs is to fund activities previously financed on a reimbursable basis as a direct appropriation in FY 1987.

SUMMARY OF INCREASES AND DECREASES
(On basis of adjusted appropriation)

Item of Change	1986 Estimated	Program Changes	1987 Estimated
Payments under the Hatch Act	$155,545,000	- -	$155,545,000
Cooperative forestry research	12,975,000	- -	12,975,000
Payments to 1890 colleges and Tuskegee University	23,333,000	- -	23,333,000
Special research grants	30,324,000	-$30,324,000	- -
Competitive research grants	44,233,000	-1,808,000	42,425,000
Animal health and disease research, section 1433	5,725,000	-5,725,000	- -
Federal administration (direct appropriation)	1,612,000	-1,462,000	150,000
1890 Research Facilities	9,940,000	- -	9,940,000
Higher Education	7,770,000	-5,782,000	1,988,000
TOTAL AVAILABLE	291,457,000	-45,101,000	246,356,000

PROJECT STATEMENT
(On basis of adjusted appropriation)

Project	1985 Actual Amount	1985 Actual Staff Years	1986 Estimated Amount	1986 Estimated Staff Years	Increase or Decrease	1987 Estimated Amount	1987 Estimated Staff Years
1.Hatch Act:							
Research program:							
Formula funds	$114,234,100		$114,599,228		- -	$114,599,228	
Regional research.	36,260,095		36,053,313		- -	36,053,313	
Subtotal	150,494,195		150,652,541		- -	150,652,541	
Penalty Mail	455,000		476,000		- -	476,000	
Federal Admin. (3%)	4,429,045		4,416,459		- -	4,416,459	
Total	155,378,240	59	155,545,000	60	- -	155,545,000	74
2.Cooperative forestry research:							
Research program ..	12,661,410		12,585,750		- -	12,585,750	
Federal Admin. (3%)	391,590		389,250		- -	389,250	
Total	13,053,000	5	12,975,000	5	- -	12,975,000	5
3.Payments to 1890 colleges and Tuskegee University:							
Research program ..	22,102,722		22,633,010		- -	22,633,010	
Federal Admin. (3%)	704,220		699,990		- -	699,990	
Total	22,806,942	8	23,333,000	9	- -	23,333,000	9
4.Special research grants:							
Soil erosion in Pacific Northwest	622,000		618,000		-$618,000	- -	
Dried bean research, North Dakota	50,000		50,000		-50,000	- -	
Food systems research group, Wisconsin .	156,000		155,000		-155,000	- -	
Integrated pest management	3,091,000		3,073,000		-3,073,000	- -	
Pesticide clearance	1,440,000		1,431,000		-1,431,000	- -	
Minor use animal drugs	240,000		239,000		-239,000	- -	
Pesticide impact assessment	2,069,000		2,057,000		-2,057,000	- -	
Rural development centers.....	311,000		379,000		-379,000	- -	
Soybean cyst nematode, Missouri ...	300,000		298,000		-298,000	- -	
Bean and beet research, Michigan .	97,000		97,000		-97,000	- -	
Animal health research	6,000,000		5,964,000		-5,964,000	- -	
Aquaculture, Stoneville, Mississippi	420,000		418,000		-418,000	- -	
Dairy & beef photoperiod, Michigan .	35,000		35,000		-35,000	- -	
Aquaculture research	518,000		298,000		-298,000	- -	
Germplasm resources	1,000,000		994,000		-994,000	- -	
Peach tree short life,South Carolina	192,000		191,000		-191,000	- -	
Blueberry shoestring virus, Michigan ..	96,000		96,000		-96,000	- -	
Mosquito research, riceland agroecosystem	480,000		477,000		-477,000	- -	
TCK smut (wheat) ..	361,000		359,000		-359,000	- -	
Sunflower insects, North Dakota and South Dakota.....	150,000		199,000		-199,000	- -	
Tropical & subtropical research.	3,250,000		3,231,000		-3,231,000	- -	
Dairy goat research, Prairie View A&M, Texas	100,000		99,000		-99,000	- -	
Sugarland use research, Hawaii .	150,000		149,000		-149,000	- -	
Integrated production systems, Oklahoma	250,000		249,000		-249,000	- -	

Project	1985 Actual		1986 Estimated		Increase or Decrease	1987 Estimated	
	Amount	Staff Years	Amount	Staff Years		Amount	Staff Years
Preservation and processing, Oklahoma	$100,000		$149,000		-$149,000	- -	
Potato research ...	600,000		795,000		-795,000	- -	
Asparagus yield decline, Michigan.	100,000		99,000		-99,000	- -	
Biocontrol of grasshoppers, Kansas ..	50,000		50,000		-50,000	- -	
Wool research, Texas	150,000		149,000		-149,000		
Agricultural Policy Institute, Iowa & Missouri	450,000		373,000		-373,000	- -	
Biomass from dairy processing waste, Missouri	300,000		298,000		-298,000	- -	
Stone fruit decline, Michigan	300,000		298,000		-298,000	- -	
EDB replacement, Hawaii	300,000		298,000		-298,000	- -	
Integrated reproduction management, Nebraska	100,000		99,000		-99,000	- -	
Cranberry/blueberry disease & breeding, New Jersey	100,000		99,000		-99,000	- -	
Alternative cropping systems in the Southeast	300,000		298,000		-298,000	- -	
Maple research, Vermont	100,000		99,000		-99,000	- -	
Wood utilization ..	3,000,000		2,982,000		-2,982,000	- -	
Fort Stanton Experimental Station relocation, New Mexico	- -		1,200,000		-1,200,000	- -	
Warmwater aquaculture: Mississippi.....	3,499,800		200		-200	- -	
Apple quality research, Michigan .	- -		99,000		-99,000	- -	
Aquaculture planning grant, Hawaii	- -		149,000		-149,000	- -	
Fruit & vegetable production & marketing, Kentucky	- -		149,000		-149,000	- -	
Plant stress, New Mexico, California, and Texas	- -		298,000		-298,000	- -	
Milk consumption, Pennsylvania	- -		298,000		-298,000	- -	
International livestock program, Kansas	- -		99,000		-99,000	- -	
Stored grain insects, Kansas	- -		298,000		-298,000	- -	
Federal Admin. (4%)	(924,640)		(1,193,480)		(-1,193,480)	(- -)	
Total	30,827,800	17	29,832,200	17	-29,832,200	- -	- -
Critical Agricultural Materials Act of 1984:							
Research program...	680,940		1,159,150		-1,159,150	- -	
Federal Admin. (3%)	21,060		35,850		-35,850	- -	
Total	702,000		1,195,000		-1,195,000	- -	
Rangeland research grants (Subtitle M, P.L 97-98):							
Research program ..	485,000		482,090		-482,090	- -	
Federal Admin. (3%)	15,000		14,910		-14,910	- -	
Total	500,000		497,000		-497,000	- -	
	32,029,800	17	31,524,200	17	-31,524,200(1)	- -	- -

Project	1985 Actual Amount	1985 Actual Staff Years	1986 Estimated Amount	1986 Estimated Staff Years	Increase or Decrease	1987 Estimated Amount	1987 Estimated Staff Years
5.Competitive research grants:							
Plant science.....	$16,500,000		$14,413,000		+$1,174,000	$15,587,000	
Soybean research .	(518,000)		(515,000)		(-515,000)	(- -)	
Acid precipitation	(695,000)		(691,000)		(- -)	(691,000)	
Alcohol fuels	(540,000)		(537,000)		(-537,000)	(- -)	
Human nutrition ...	2,000,000		2,485,000		- -	2,485,000	
Animal science	4,500,000		4,473,000		- -	4,473,000	
Brucellosis	(500,000)		(497,000)		(- -)	(497,000)	
Reproductive efficiency	(2,500,000)		(2,485,000)		(- -)	(2,485,000)	
Pest science	3,000,000		2,982,000		-2,982,000	- -	
Gypsy moths	(1,000,000)		(994,000)		(-994,000)	(- -)	
Boll weevil/boll worm	(1,000,000)		(994,000)		(-994,000)	(- -)	
Pine bark beetle .	(1,000,000)		(994,000)		(-994,000)	(- -)	
Biotechnology (animal and plant)	20,000,000		19,880,000		- -	19,880,000	
Federal Admin. (4%)	(1,380,000)		(1,769,320)		(-72,320)	(1,697,000)	
Total	46,000,000	38	44,233,000	40	-1,808,000(2)	42,425,000	45
6.Animal health and disease research, section 1433:							
Research program ..	5,529,600		5,496,000		-5,496,000	- -	
Federal Admin. (4%)	230,400		229,000		-229,000	- -	
Total	5,760,000	2	5,725,000	2	-5,725,000(3)	- -	- -
7.Federal administration (direct appro.)	1,452,000	2	1,612,000	2	-1,462,000(4)	150,000	2
8.1890 Research Facilities:							
Research program ..	9,600,000		9,542,400		- -	9,542,400	
Federal Admin. (4%)	400,000		397,600		- -	397,600	
Total	10,000,000	- -	9,940,000	- -	- -	9,940,000	- -
9.Higher Education:							
Morrill-Nelson Funds (Permanent Appropriation)	2,800,000		2,800,000		-2,800,000	- -	
Graduate Training Grants	5,000,000		2,982,000		-2,982,000	- -	
Strengthening Grants 1890 Colleges	2,000,000		1,988,000		- -	1,988,000	
Federal Admin. (3%)	(150,000)		(149,100)		(-89,460)	(59,640)	
Total	9,800,000	- -	7,770,000	- -	-5,782,000(5)	1,988,000	- -
10.Forestry competitive grants:							
Research program .	7,604,800		- -		- -	- -	
Federal Admin. (3%)	235,200		- -		- -	- -	
Total	7,840,000	- -	- -	- -	- -	- -	- -
Total obligations	304,119,982	131	292,657,200	135	-46,301,200	246,356,000	135
Unobligated Balances:							
Lapsing	1,772,818	- -	- -	- -	- -	- -	- -
Available, start of year	- -	- -	-1,200,200	- -	+1,200,200	- -	- -
Available, end of year	1,200,200	- -	- -	- -	- -	- -	- -
Total available or estimate	307,093,000	131	291,457,000	135	-45,101,000	246,356,000	135
Transfer from Agricultural Research Service	-2,800,000	- -	- -	- -			
Transfer to Departmental Administration and Office of Governmental and Public Affairs ..	+23,000	- -	+23,000	- -			
Total, appropriation .	304,316,000	131	291,480,000	135			

EXPLANATION OF PROGRAM

Appropriations for the Cooperative State Research Service funds activities are authorized under the following Acts:

1. Payments to agricultural experiment stations under the Hatch Act, and for penalty mail - Agricultural Experiment Stations Act of August 11, 1955, Hatch Act of 1887 as amended - 7 U.S.C. 361a-361i; Education Amendments of 1972, Public Law 92-318, June 23, 1972; Public Law 93-471, October 26, 1974; Public Law 95-113, September 29, 1977, as amended; Public Law 96-374, October 3, 1980; Public Law 97-98, December 22, 1981; Public Law 99-198, December 23, 1985.

   Funds under the Hatch Act are allocated to the State agricultural experiment stations of the 50 States, District of Columbia, Puerto Rico, Guam, the Virgin Islands, Micronesia, and American Samoa for research to promote a sound and prosperous agriculture and rural life. The Hatch Act provides that the distribution of Federal payments to States for fiscal year 1955 shall become a fixed base and that any sums appropriated in excess of the 1955 level shall be distributed in the following manner:

   -20% shall be allotted equally to each State.
   -not less than 52% shall be allotted to the States as follows:
      one-half in an amount proportionate to the relative rural population of each State to the total rural population of all States, and
      one-half in an amount proportionate to the relative farm population of each State to the total farm population of all States.
   -not more than 25% shall be allotted to the States for cooperative research in which two or more State agricultural experiment stations are cooperating to solve problems that concern the agriculture of more than one State.
   -3% shall be available to the Secretary of Agriculture for the administration of this Act.

   The Act also provides that any amount in excess of $90,000 available for allotment to any State, exclusive of the regional research fund, shall be matched by the State out of its own funds for research, and for the establishment and maintenance of facilities necessary for the performance of such research. Also, in the case of Guam, the Virgin Islands, Micronesia, and American Samoa, agencies are required by law to waive any requirement for local matching funds under $200,000.

   The Hatch Act provides for the mailing under penalty indicia by agricultural experiment stations of bulletins, reports, periodicals, reprints of articles, and other publications, including lists of publications necessary for dissemination of results of research. Mailings include not only those to individual farmers upon request but also to newspapers, libraries, other experiment stations, and organizations interested in results of research and dissemination of such results. Under Title 39 U.S.C. 3206(b) and 3203(a)(4), the Department paid to the U.S. Postal Service $450,240 to cover postage of mail sent under the penalty privilege by the State agricultural experiment stations during fiscal year 1985. Funds of $476,000 have been set-aside from the fiscal year 1986 appropriation and the fiscal year 1987 budget under the Hatch Act for payments to the U.S. Postal Service.

   Three percent of funds appropriated under the Hatch Act is set-aside for Federal administration. Administration includes disbursement of funds and a continuous review and evaluation of the research programs of the State agricultural experiment stations supported wholly or in part from Hatch funds. Cooperative State Research Service encourages and assists in the establishment of cooperation within and between the States, and also actively participates in the planning and coordination of research programs between the States and the Department at the regional and national level.

2. Cooperative Forestry Research - The Cooperative Forestry Research Act of October 10, 1962, 16 U.S.C. 582a-7; Education Amendments of 1972, Public Law 92-318, June 23, 1972; Public Law 96-374, October 3, 1980; Public Law 97-98, December 22, 1981; Public Law 99-198, December 23, 1985.

The Act authorizes funding of research in State institutions certified by a State representative designated by the governor of each State. The Act provides that appropriated funds be apportioned among States as determined by the Secretary after consultation with a national advisory council of not fewer than sixteen members representing Federal and State agencies concerned with developing and utilizing the Nation's forest resources, the forest industries, the forestry schools of the State-certified eligible institutions, State agricultural experiment stations, and volunteer public groups concerned with forests and related natural resources. Determination of apportionments follows consideration of pertinent factors including areas of non-federal commercial forest land, volume of timber cut from growing stock, and the non-Federal dollars expended on forestry research in the State. The Act also provides that payments must be matched by funds made available and budgeted from non-Federal sources by the certified institutions for expenditure for forestry research. Three percent of funds appropriated under this Act is set-aside for Federal administration.

3. Payments to 1890 Colleges and Tuskegee University - The National Agricultural Research, Extension, and Teaching Policy Act of 1977, Section 1445, Public Law 95-113, September 29, 1977; Public Law 95-547, October 28, 1978; Public Law 97-98, December 22, 1981; Public Law 99-198, December 23, 1985.

Public Law 95-113, as amended, provides for support of continuing agricultural research at colleges eligible to receive funds under the Act of August 30, 1890, including Tuskegee University. Beginning with fiscal year 1979, there shall be appropriated funds for each fiscal year, an amount not less than 15% of the total for such year under Section 3 of the Act of March 2, 1887. Distribution of payments made available under section 2, Act of August 4, 1965, for fiscal year 1978 are a fixed base and sums in excess of the 1978 level shall be distributed as follows:

-3% shall be available to the Secretary of Agriculture.
-Payments to States in fiscal year 1978 is a fixed base. Of funds in excess of this amount:
20% shall be allotted equally to each State.
40% shall be allotted in an amount proportionate to the rural population of the State in which the eligible institution is located to the total rural population of all the States in which eligible institutions are located, and
40% shall be allotted in an amoynt proportionate to the farm population of the State in which the eligible institution is located to the total farm population of all the States in which eligible institutions are located.

Allotments to Tuskegee University and Alabama A&M University shall be determined as if each institution were in a separate State. Three percent of the funds appropriated under this Act is set aside for Federal administration. This includes disbursements of funds and review and evaluation of proposals.

4. Special Research Grants - Section 2(c), Act of August 4, 1965, 7 U.S.C. 450i as amended by Public Law 95-113, September 29, 1977; Section 1419, Public Law 95-113, as amended by Public Law 96-294, June 30, 1980; Public Law 97-98, December 22, 1981; Public Law 98-284, May 16, 1984; Public Law 99-198, December 23, 1985.

Section 2 of the Act of August 4, 1965, as amended, authorizes Special Research Grants for periods not to exceed five years to land-grant colleges

and universities, research foundations established by land-grant colleges and universities, State agricultural experiment stations, and to all colleges and universities having a demonstrable capacity in food and agriculture research, to carry out research to facilitate or expand promising breakthroughs in areas of the food and agricultural sciences of importance to the Nation; and to State agricultural experiment stations, land-grant colleges and universities, research foundations established by land-grant colleges and universities, colleges and universities receiving funds under the Act of October 10, 1962, and accredited schools or colleges of veterinary medicine to facilitate or expand ongoing State-Federal food and agricultural research. Special Research Grants are awarded on the discretionary basis as well as using a competitive peer panel process in the selection of proposals to be funded.

Research grants are also awarded under the Critical Agricultural Materials Act, Public Law 98-284. Rangeland Research Grants are awarded in accordance with subtitle M of Public Law 97-98.

5. Competitive Research Grants - Section 2(b), Act of August 4, 1965, 7 U.S.C. 450i as amended by Public Law 95-113, September 29, 1977; Public Law 97-98, December 22, 1981; Public Law 99-198, December 23, 1985.

Section 2 of the Act of August 4, 1965, as amended, authorizes Competitive Research Grants for periods not to exceed five years to State agricultural experiment stations, all colleges and universities, other research institutions and organizations, Federal agencies, private organizations or cooporations, and individuals to further the programs of the Department of Agriculture. By obtaining the participation of outstanding researchers in the entire U.S. scientific community, emphasis will be placed on basic research critical to food production and human nutrition including biological stress of plants, genetic mechanisms of plants, plant nitrogen fixation, plant photosynthesis, human nutrient requirements, animal science, pest science and biotechnology.

6. Animal Health and Disease Research - The National Agricultural Research, Extension, and Teaching Policy Act of 1977, Section 1433, Public Law 95-113, September 29, 1977; Public Law 97-98, December 22, 1981; Public Law 99-198, December 23, 1985.

Section 1433 provides for support of livestock and poultry disease research in accredited schools or colleges of veterinary medicine or State agricultural experiment stations that conduct animal health and disease research. These funds shall be distributed as follows:

- 4% shall be retained by the Department of Agriculture for administration, program assistance to the eligible institutions, and program coordination.
- 48% shall be distributed in an amount proportionate to the value of and income to producers from domestic livestock and poultry in each State to the total value of and income to producers from domestic livestock and poultry in all the States.
- 48% shall be distributed in an amount proportionate to the animal health research capacity of the eligible institutions in each State to the total animal health research capacity in all the States.

Eligible institutions must provide non-Federal matching funds in States receiving annual amounts in excess of $100,000 under this authorization.

7. Federal Administration (direct appropriation) - Authority for direct appropriations is provided in the annual Agriculture, Rural Development, and Related Agencies Appropriations Act. These funds are used to provide support services in connection with research planning and coordination of all programs administered by Cooperative State Research Service.

8. Grants to Upgrade 1890 Land-Grant College Research Facilities. National Agricultural Research, Extension, and Teaching Policy Act Amendments of 1981, Section 1433, Public Law 97-98, December 22, 1981; Public Law 99-198, December 23, 1985.

   Section 1433 of the Act authorizes funds for grants to the institutions eligible to receive funds under the Act of August 30, 1890, including Tuskegee University, for the acquisition and improvement of research facilities and equipment. Four percent of the sums appropriated shall be available to the Secretary for administration of the grant program. The remaining funds shall be available for grants to the eligible institutions for the purpose of assisting them in the purchase of equipment and land, and the planning, construction, alteration, or renovation of buildings to strengthen their capacity to conduct research in the food and agricultural sciences.

9. Higher Education. The National Agricultural Research, Extension, and Teaching Policy Act of 1977, Section 1417, Public Law 95-113, as amended.

   Higher Education-Strengthening Grants pursuant to Section 1417(a)(2)(A) support resident instruction programs at historically black land-grant institutions and Tuskegee University. Higher Education-Graduate Training Grants (Graduate Fellowships) pursuant to Section 1417(a)(3)(B) are awarded on a competitive basis to colleges and universities to conduct graduate training programs to stimulate the development of food and agricultural scientific expertise in targeted national need areas.

   Higher education in the food and agricultural sciences at the land-grant institutions is also supported through a permanent appropriation in the Second Morrill Act of 1890.

10. Forestry Competitive Grants. Forest and Rangeland Renewable Resources Research Act of 1978, Section 5, Public Law 95-307, June 30, 1978.

    Section 5 of the Act authorizes competitive grants related to forest and rangeland renewable resources to Federal, State, and other governmental agencies, public or private agencies, institutions, universities, and organizations, and businesses and individuals in the United States. Emphasis is placed on basic research in the areas of harvesting, wood utilization and forest biology.

JUSTIFICATION OF INCREASES AND DECREASES

(1) A decrease of $31,524,200 for Special Research Grants, Critical Agricultural Materials Act, and Rangeland Research Grants ($31,524,200 available in 1986. This amount includes $1,200,200 in fiscal year 1985 unobligated funds].

Need for Change. These grants programs have concentrated on problems national interest beyond the normal emphasis in the formula programs. The Hatch Act formula and related base funded programs constitute the core of the State-Federal research partnership and, when put together with State funding, provide the basic laboratory facilities, scientists, graduate students, and support necessary for the long term stability of agricultural research. Thus, these base programs become the highest priority of the State-Federal research partnership. Therefore, the base programs have been increased in FY 1987 due to Gramm-Rudman-Hollings and this reduction is proposed in line with the Administration's overall reductions in Federal spending.

Nature of Change. This change will eliminate this specific funding support for these programs. Due to the discretionary nature of the Hatch Act formula and related base funded programs, amounts allotted to State institutions permit the institutions to fund research in those areas that they identify as high priority. This flexibility could provide for maintaining some of the programs if the State institutions wish to continue the research. The funding support which has been provided through this program for Germplasm Resources in support of the national system of clonal repositories for fruit and nut crops is proposed to be continued by the Agricultural Research Service.

(2) A net decrease of $1,808,000 for Competitive Research Grants ($44,233,000 available in 1986) consisting of:

(a) An increase of $1,174,000 for Competitive Research Grants for plant science research ($14,413,000 available in 1986).

Need for Change. Target areas in the plant sciences have been a high priority in the Competitive Research Grants program since it was initiated in 1978. Many high quality proposals have been submitted each year for which funds are not available. Basic plant science research continues to be important to the maintenance of efficient crop productivity. These funds would provide for increased support for the areas of photosynthesis, nitrogen fixation, genetic mechanisms for crop improvement, and plant protection from biological stress.

Nature of Change. Photosynthesis research would include investigations on the regulation of key processes involved in photosynthesis and the genetics of such processes. Research in biological nitrogen fixation will elucidate mechanisms of nitrogen fixation, the nature of symbiotic relationships, and the metabolic fate of fixed nitrogen in the plant-soil-microbe ecosystem. Studies in the genetic mechanisms for crop improvement will focus on the basic factors related to the regulation of the plant genetic material as well as novel approaches to plant breeding. Biological stress research will emphasize plant-pest interactions and responses, and the molecular mechanisms involved.

Funding support for the earmarked areas of soybeans and alcohol fuels research will be eliminated. Much of the soybean research could be carried out within the plant science area of the Competitive Research Grants program. The scientists initially funded in the soybean program will have had the advantage of significant grants to build a program that can successfully compete in the more general area of plant science. Due to the discretionary nature of the Hatch Act formula and related base funded programs, amounts allotted to State institutions permit the institutions to fund soybean and alcohol fuels research if they identify them as high priority and wish to continue the research.

(b) A decrease of $2,982,000 for Competitive Research Grants for pest science research ($2,982,000 available in 1986).

Need for Change. This change will eliminate the special funding for research on gypsy moth, boll weevil/bollworm, and pine bark beetle. Grants awarded in prior years have provided substantial funding for research on these pests that will provide rapid advances in our understanding of the insects under study. The information obtained may be used as a model for other insects.

Nature of Change. Much of this pest science research could be carried out within the plant science and biotechnology areas of the Competitive Research Grants program. The scientists initially funded in the pest science program will have had the advantage of significant grants to build a program that can successfully compete in the more general areas of biological stress and biotechnology.

(3) A decrease of $5,725,000 for Animal Health and Disease Research, Sec. 1433, P.L. 95-113 ($5,725,000 available in 1986).

Need for Change. The Animal Health and Disease Research program has supported livestock and poultry disease research in accredited colleges of veterinary medicine and State Agricultural Experiment Stations. This reduction is proposed based on the same factors described under the Special Research Grants program.

Nature of Change. This change will eliminate funding support for this program. Animal health and disease research is being conducted in other ongoing Federal and State research programs. The Biotechnology and Animal Science Competitive Research Grants programs also offer opportunities for supporting animal health research.

(4) A net decrease of $1,462,000 for Federal Administration (direct appropriation) ($1,612,000 available in 1986).

Need for Change. A decrease of $1.462 thousand is proposed including $1.292 thousand for the Gulf coast shrimp aquaculture project and $170 thousand for Federal Administration (direct appropriation). In addition to the Federal Administration direct appropriation, under provisions of statutory authority 3% or 4% respectively is made available for set aside for Federal administration from the research program funds appropriated to Cooperative State Research Service. The FY 1987 request would provide an aggregate of $7.8 million for Federal administration from all funding sources, a net decrease of $1.9 million from the FY 1986 estimate of $9.7 million.

Nature of Change. The $70 thousand funding for the Northern Marianas research program and $80 thousand funding for the Ag in the Classroom program will be retained.

(5) A decrease of $5,782,000 for higher education ($7,770,000 available in 1986) consisting of:

(a) A decrease of $2,800,000 for the Morrill-Nelson program ($2,800,000 available in 1986).

Need for Change. The Federal government has provided funds for higher education in the food and agricultural sciences at land-grant institutions through a permanent appropriation in the Second Morrill Act of 1890. The funding level has remained at the $50,000 level for each State and territory since 1912. The amount of funds per institution is small by current day standards.

In recent years the research programs and facilities at the 1890 land-grant institutions have been strengthened through the provisions of Sections 1444 and 1445 of P.L. 95-113, as amended, and Section 1433 of P.L. 97-98. Funding of $1,988,000 is also available for Higher Education-Strengthening Grants to be distributed to the 1890 Colleges and Universities, Tuskegee University, and the University of the District of Columbia to provide a stable support base for resident instruction at these institutions.

Nature of Change. In FY 1987 no funding is proposed for the Morrill-Nelson permanent appropriation since a grant program for the 18 historically black land-grant colleges and universities is available. For FY 1987 appropriation language has been proposed for this purpose.

(b) A decrease of $2,982,000 for Higher Education-Graduate Training Grants ($2,982,000 available in 1986).

Need for Change. This proposal is in line with the Administration's reductions in government spending.

Nature of Change. This change will terminate the USDA competitive Graduate Training Grants (Graduate Fellowships) program. Support for the development of agricultural expertise will be provided indirectly through the Competitive Research Grants program and through the provisions of the Hatch Act formula and related base funded programs.

Table 2
Payments to State Agricultural Experiment Stations under the Hatch Act

	FY 1985 Actual			FY 1986 Estimate			FY 1987 Est
	Regular Formula	Regional Research	Total	Regular Formula	Regional Research	Total	Regular Formula
Alabama	2,663,864	735,187	3,399,051	2,643,918	726,736	3,370,654	2,643,918
Alaska	725,080	124,691	849,771	719,334	122,512	841,846	719,334
American Samoa	114,529	- -	114,529	600,919	- -	600,919	600,919
Arizona	997,393	659,300	1,656,693	989,234	647,785	1,637,019	989,234
Arkansas	2,288,611	644,321	2,932,932	2,270,547	636,914	2,907,461	2,270,547
California	2,971,526	1,389,794	4,361,320	2,945,028	1,337,827	4,282,855	2,945,028
Colorado	1,343,154	948,231	2,291,385	1,331,712	973,227	2,304,939	1,331,712
Connecticut	1,131,423	430,016	1,561,439	1,122,331	425,588	1,547,919	1,122,331
Delaware	783,366	321,669	1,105,035	776,948	318,357	1,095,305	776,948
Dist. of Col.	209,885	89,723	299,608	482,315	91,911	574,226	482,315
Florida	1,878,681	584,433	2,463,114	1,862,043	592,714	2,454,757	1,862,043
Georgia	2,963,356	975,035	3,938,391	2,939,260	968,905	3,908,165	2,939,260
Guam	607,428	102,605	710,033	621,571	104,902	726,473	621,571
Hawaii	776,512	331,103	1,107,615	774,107	328,487	1,102,594	774,107
Idaho	1,259,355	519,803	1,779,158	1,248,198	510,725	1,758,923	1,248,198
Illinois	3,747,272	886,562	4,633,834	3,713,564	861,662	4,575,226	3,713,564
Indiana	3,420,255	737,053	4,157,308	3,388,759	726,207	4,114,966	3,388,759
Iowa	3,574,766	1,254,954	4,829,720	3,540,999	1,298,723	4,839,722	3,540,999
Kansas	2,190,742	728,828	2,919,570	2,171,417	723,656	2,895,073	2,171,417
Kentucky	3,466,343	732,811	4,199,154	3,440,370	727,756	4,168,126	3,440,370
Louisiana	2,116,661	608,181	2,724,842	2,100,266	601,190	2,701,456	2,100,266
Maine	1,105,867	448,186	1,554,053	1,096,826	443,571	1,540,397	1,096,826
Maryland	1,526,180	566,590	2,092,770	1,513,808	558,124	2,071,932	1,513,808
Massachusetts	1,335,589	550,473	1,886,062	1,324,802	544,803	1,869,605	1,324,802
Michigan	3,451,255	775,947	4,227,202	3,420,919	764,661	4,185,580	3,420,919
Micronesia	478,591	- -	478,591	629,923	- -	629,923	629,923
Minnesota	3,366,438	855,395	4,221,833	3,335,843	818,038	4,153,881	3,335,843
Mississippi	2,763,196	764,848	3,528,044	2,744,033	757,902	3,501,935	2,744,033
Missouri	3,252,533	691,088	3,943,621	3,222,786	680,766	3,903,552	3,222,786
Montana	1,191,666	582,149	1,773,815	1,181,391	571,979	1,753,370	1,181,391
Nebraska	2,025,262	796,402	2,821,664	2,006,946	772,525	2,779,471	2,006,946
Nevada	717,126	318,741	1,035,867	711,302	313,171	1,024,473	711,302
New Hampshire	894,120	322,344	1,216,464	886,522	319,023	1,205,545	886,522
New Jersey	1,313,172	940,634	2,253,806	1,302,534	964,372	2,266,906	1,302,534
New Mexico	1,029,337	350,692	1,380,029	1,021,131	344,566	1,365,697	1,021,131
New York	3,313,677	1,381,865	4,695,542	3,286,049	1,336,676	4,622,725	3,286,049
North Carolina	4,499,525	1,054,252	5,553,777	4,464,698	1,042,132	5,506,830	4,464,698
North Dakota	1,506,678	521,371	2,028,049	1,493,814	512,976	2,006,790	1,493,814
Ohio	4,088,829	837,821	4,926,650	4,052,213	825,830	4,878,043	4,052,213
Oklahoma	2,091,193	528,675	2,619,868	2,073,145	522,597	2,595,742	2,073,145
Oregon	1,570,265	824,514	2,394,779	1,556,316	810,113	2,366,429	1,556,316
Pennsylvania	4,069,898	1,065,438	5,135,336	4,035,127	1,094,276	5,129,403	4,035,127
Puerto Rico	2,984,682	654,647	3,639,329	2,967,824	647,122	3,614,946	2,967,824
Rhode Island	717,763	320,836	1,038,599	715,774	330,346	1,046,120	715,774
South Carolina	2,315,636	607,150	2,922,786	2,298,514	600,170	2,898,684	2,298,514
South Dakota	1,546,673	525,791	2,072,464	1,533,185	517,348	2,050,533	1,533,185
Tennessee	3,336,109	752,743	4,088,852	3,309,686	744,087	4,053,773	3,309,686
Texas	4,302,357	1,070,771	5,373,128	4,265,249	1,058,461	5,323,710	4,265,249
Utah	905,427	600,852	1,506,279	898,142	590,357	1,488,499	898,142
Vermont	949,695	284,292	1,233,987	941,873	288,529	1,230,402	941,873
Virgin Islands	527,973	105,322	633,295	607,868	104,111	711,979	607,868
Virginia	2,848,955	709,900	3,558,855	2,826,426	703,805	3,530,231	2,826,426
Washington	1,789,696	1,179,760	2,969,456	1,774,046	1,216,001	2,990,047	1,774,046
West Virginia	1,809,217	468,633	2,277,850	1,796,152	464,882	2,261,034	1,796,152
Wisconsin	3,375,855	938,220	4,314,075	3,345,301	913,384	4,258,685	3,345,301
Wyoming	850,710	487,872	1,338,582	843,730	475,759	1,319,489	843,730
Other	- -	208,700	208,700	- -	224,400	224,400	- -
SUBTOTAL	113,081,347	35,897,214	148,978,561	113,166,738	35,602,647	148,769,385	113,166,738
Regional Res. Undistributed	- -	- -	- -	- -	- -	- -	35,602,647
Federal Admin.	- -	- -	4,429,045	- -	- -	4,416,459	4,416,459
Penalty Mail	- -	- -	450,240	- -	- -	470,050	470,050
Unoblig. Bal.	1,041,208	27,968	1,105,760	- -	- -	- -	- -
Small Business Act	1,152,753	362,881	1,520,394	1,432,490	450,666	1,889,106	1,889,106
TOTAL	114,275,308	36,288,063	156,484,000	114,599,228	36,053,313	155,545,000	155,545,000

Table 3
Distribution of Funds under the McIntire-Stennis Cooperative Forestry Research Act
(In Dollars)

State/Recipient	Fiscal Year 1985 Actual	Fiscal Year 1986 Estimate	Fiscal Year 1987 Estimate
ALABAMA			
Agricultural Experiment Station, Auburn Univ..	$420,001	$415,773	$415,773
ALASKA			
Agricultural Experiment Station, Univ. of Alaska	198,660	196,764	196,764
AMERICAN SAMOA			
American Samoa Community College	- -	- -	- -
ARIZONA			
Agricultural Experiment Station, University of Arizona	115,140	106,204	106,204
School of Forestry, Northern Arizona Univ. ...	115,140	106,204	106,204
ARKANSAS			
Agricultural Experiment Station, University of Arkansas	380,476	376,663	376,663
CALIFORNIA			
Agricultural Experiment Station, University of California	370,886	367,156	367,156
Department of Forestry, California State University, Humboldt	41,210	40,795	40,795
COLORADO			
College of Forestry and Natural Resources, Colorado State University	214,471	235,873	235,873
CONNECTICUT			
Agricultural Experiment Station, New Haven ...	107,494	112,376	112,376
Agricultural Experiment Station, University of Connecticut, Storrs	35,831	37,459	37,459
DELAWARE			
Agricultural Experiment Station, University of Delaware	80,085	79,440	79,440
FLORIDA			
Agricultural Experiment Station, University of Florida	340,950	329,733	329,733
GEORGIA			
School of Forest Resources, Univ. of Georgia .	427,905	423,594	423,594
GUAM			
Agricultural Experiment Station, Univ. of Guam	- -	- -	- -
HAWAII			
Agricultural Experiment Station, University of Hawaii	95,895	102,904	102,904
IDAHO			
College of Forestry, University of Idaho	301,425	290,625	290,625
ILLINOIS			
Agricultural Experiment Station, University of Illinois	91,425	90,561	90,561
Department of Forestry, Southern Illinois Univ.	91,425	90,561	90,561
INDIANA			
Agricultural Experiment Station, Purdue Univ..	214,471	220,229	220,229
IOWA			
Agriculture & Home Economics Experiment Station, Iowa State University	127,515	126,369	126,369
KANSAS			
Agricultural Experiment Station, Kansas State University	111,705	118,547	118,547
KENTUCKY			
Agricultural Experiment Station, Univ. of Kentucky	277,711	267,159	267,159
LOUISIANA			
Agricultural Experiment Station, Louisiana State University	271,866	269,139	269,139
School of Forestry, Louisiana Tech University.	116,514	115,346	115,346
MAINE			
Agricultural Experiment Station, Univ. of Maine	364,665	368,841	368,841
MARYLAND			
Agricultural Experiment Station, University of Maryland	174,945	173,299	173,299
MASSACHUSETTS			
Agricultural Experiment Station, University of Massachusetts	159,136	157,656	157,656

State/Recipient	Fiscal Year 1985 Actual	Fiscal Year 1986 Estimate	Fiscal Year 1987 Estimate
MICHIGAN			
Agricultural Experiment Station, Michigan State University	$124,191	$120,340	$120,340
School of Natural Resources, University of Michigan	124,191	120,340	120,340
Department of Forestry, Michigan Tech. Univ.	124,191	120,340	120,340
MICRONESIA			
College of Micronesia	- -	- -	- -
MINNESOTA			
Agricultural Experiment Station, University of Minnesota	309,330	298,446	298,446
MISSISSIPPI			
School of Forest Resources, Mississippi State University	404,190	392,307	392,307
MISSOURI			
Agricultural Experiment Station, University of Missouri	261,900	259,338	259,338
MONTANA			
School of Forestry, University of Montana	253,995	251,516	251,516
NEBRASKA			
Agricultural Experiment Station, University of Nebraska	103,800	87,262	87,262
NEVADA			
Agricultural Experiment Station, University of Nevada	72,180	71,618	71,618
NEW HAMPSHIRE			
Agricultural Experiment Station, University of New Hampshire	190,755	188,943	188,943
NEW JERSEY			
Agricultural Experiment Station, Rutgers Univ.	151,230	134,191	134,191
NEW MEXICO			
Agricultural Experiment Station, New Mexico State University	167,040	165,477	165,477
NEW YORK			
Agricultural Experiment Station, Cornell Univ.	83,261	84,389	84,389
College of Environmental Science and Forestry, State University of New York	249,784	253,166	253,166
NORTH CAROLINA			
School of Forest Resources, North Carolina State University	396,285	400,128	400,128
NORTH DAKOTA			
Agricultural Experiment Station, North Dakota State University	56,370	63,796	63,796
OHIO			
Agricultural Experiment Station, Ohio State University	246,090	243,694	243,694
OKLAHOMA			
Agricultural Experiment Station, Oklahoma State University	222,375	228,051	228,051
OREGON			
School of Forestry, Oregon State University	443,715	439,238	439,238
PENNSYLVANIA			
Agricultural Experiment Station, Pennsylvania State University	317,236	314,090	314,090
PUERTO RICO			
Agricultural Experiment Station, University of Puerto Rico	48,465	48,153	48,153
RHODE ISLAND			
Agricultural Experiment Station, University of Rhode Island	64,275	55,975	55,975
SOUTH CAROLINA			
College of Forest and Recreation Resources, Clemson University	325,141	321,911	321,911
SOUTH DAKOTA			
Agricultural Experiment Station, South Dakota State University	87,990	95,083	95,083
TENNESSEE			
Agricultural Experiment Station, University of Tennessee	285,615	282,803	282,803

State/Recipient	Fiscal Year 1985 Actual	Fiscal Year 1986 Estimate	Fiscal Year 1987 Estimate
TEXAS			
Agricultural Experiment Station, Texas A&M University	$174,428	$172,688	$ 172,688
School of Forestry, Stephen F. Austin State University	174,428	172,688	172,688
UTAH			
College of Natural Resources, Utah State Univ.	135,420	142,012	142,012
VERMONT			
School of Natural Resources, Univ. of Vermont.	214,471	204,586	204,586
VIRGIN ISLANDS			
Agricultural Experiment Station, College of the Virgin Islands	- -	- -	- -
VIRGINIA			
School of Forestry and Wildlife Resources, Virginia Polytechnic Institute & State Univ.	356,760	353,198	353,198
WASHINGTON			
Agricultural Experiment Station, Washington State University	196,115	194,137	194,137
College of Forest Resources, University of Washington	239,696	237,279	237,279
WEST VIRGINIA			
Agricultural Experiment Station, West Virginia University	269,806	274,981	274,981
WISCONSIN			
Agricultural Experiment Station, University of Wisconsin	293,520	306,268	306,268
WYOMING			
Agricultural Experiment Station, University of Wyoming	119,610	110,726	110,726
Subtotal	12,534,796	12,428,428	12,428,428
Federal administration (3%)	391,590	389,250	389,250
Small Business Act	126,614	157,322	157,322
Total	13,053,000	12,975,000	12,975,000

Table 4

Evans-Allen Program Payments to 1890 Colleges and Tuskegee University
Under Section 1445, Public Law 95-113, As Amended
(In Dollars)

	Fiscal Year 1985 Actual	Fiscal Year 1986 Estimate	Fiscal Year 1987 Estimate
ALABAMA			
Alabama A&M University	$1,342,130	$1,331,812	$1,331,812
Tuskegee University	1,322,651	1,312,382	1,312,382
ARKANSAS			
University of Arkansas--Pine Bluff	1,164,970	1,155,494	1,155,494
DELAWARE			
Delaware State College	454,743	456,618	456,618
FLORIDA			
Florida A&M University	930,447	921,951	921,951
GEORGIA			
Fort Valley State College	1,463,272	1,450,805	1,450,805
KENTUCKY			
Kentucky State University	1,546,475	1,639,725	1,639,725
LOUISIANA			
Southern University	1,063,445	1,057,610	1,057,610
MARYLAND			
University of Maryland--Eastern Shore	778,685	772,333	772,333
MISSISSIPPI			
Alcorn State University	1,190,853	1,374,969	1,374,969
MISSOURI			
Lincoln University	1,548,125	1,532,332	1,532,332
NORTH CAROLINA			
North Carolina A&T State University	2,113,723	2,095,887	2,095,887
OKLAHOMA			
Langston University	885,165	1,050,604	1,050,604
SOUTH CAROLINA			
South Carolina State College	996,166	1,153,533	1,153,533
TENNESSEE			
Tennessee State University	1,604,740	1,591,003	1,591,003
TEXAS			
Prairie View A&M College	2,046,513	2,042,415	2,042,415
VIRGINIA			
Virginia State College	1,386,121	1,374,524	1,374,524
CRIS	36,800	36,100	36,100
Subtotal	21,875,024	22,350,097	22,350,097
Unobligated balance	667,058	- -	- -
Federal administration (3%)	704,220	699,990	699,990
Small Business Act	227,698	282,913	282,913
TOTAL	23,474,000	23,333,000	23,333,000

Table 5

Grants to Upgrade Research Facilities at 1890 Institutions and Tuskegee University
(In Dollars)

	Authorized Under P.L. 97-98, Sec. 1433	FY 1983 Actual	FY 1984 Actual	FY 1985 Actual	FY 1986 Estimate	FY 1987 Estimate
ALABAMA						
Alabama A&M University	$4,000,000	$800,000	$800,000	$800,000	$795,200	$795,200
Tuskegee University	7,000,000	1,400,000	1,400,000	1,400,000	1,391,600	1,391,600
ARKANSAS						
University of Arkansas--Pine Bluff	2,219,100	443,820	443,820	443,820	441,157	441,157
DELAWARE						
Delaware State College	1,751,400	350,280	350,280	350,280	348,178	348,178
FLORIDA						
Florida A&M University	1,191,400	238,280	238,280	238,280	236,850	236,850
GEORGIA						
Fort Valley State College..	3,500,000	700,000	700,000	700,000	695,800	695,800
KENTUCKY						
Kentucky State University..	1,431,800	286,360	286,360	286,360	284,642	284,642
LOUISIANA						
Southern University	2,169,600	433,920	433,920	433,920	431,317	431,317
MARYLAND						
University of Maryland--Eastern Shore	1,162,600	232,520	232,520	232,520	231,125	231,125
MISSISSIPPI						
Alcorn State University ...	1,886,100	377,220	377,220	377,220	374,957	374,957
MISSOURI						
Lincoln University	2,728,800	545,760	545,760	545,760	542,486	542,486
NORTH CAROLINA						
North Carolina A&T State University.....	4,000,000	800,000	800,000	800,000	795,200	795,200
OKLAHOMA						
Langston University	1 529,800	305,960	305,960	305,960	304,124	304,124
SOUTH CAROLINA						
South Carolina State College	1,245,100	249,020	249,020	249,020	247,526	247,526
TENNESSEE						
Tennessee State University.	2,597,300	519,460	519,460	519,460	516,343	516,343
TEXAS						
Prairie View A&M College...	7,000,000	1,400,000	1,400,000	1,400,000	1,391,600	1,391,600
VIRGINIA						
Virginia State College	2,587,000	517,400	517,400	517,400	514,295	514,295
Subtotal	48,000,000	9,600,000	9,600,000	9,600,000	9,542,400	9,542,400
Federal administration (4%) .	2,000,000	400,000	400,000	400,000	397,600	397,600
TOTAL	50,000,000	10,000,000	10,000,000	10,000,000	9,940,000	9,940,000

Table 6
Distribution of Funds for Animal Health and Disease Research,
Section 1433, P.L. 95-113
(In Dollars)

State/Recipient	Fiscal Year 1985 Actual	Fiscal Year 1986 Est.
ALABAMA		
Agricultural Experiment Station, Auburn University	$86,828	$79,414
School of Veterinary Medicine, Auburn University	29,764	34,202
School of Veterinary Medicine, Tuskegee University	10,988	6,202
ALASKA		
Agricultural Experiment Station, University of Alaska	9,318	9,336
ARIZONA		
Agricultural Experiment Station, University of Arizona	57,164	59,189
ARKANSAS		
Agricultural Experiment Station, University of Arkansas	78,085	75,500
CALIFORNIA		
Agricultural Experiment Station, Univ. of California, Berkeley	245,028	246,193
School of Veterinary Medicine, University of California, Davis	196,346	191,822
COLORADO		
Agricultural Experiment Station and College of Veterinary Medicine, Colorado State University	230,633	261,828
CONNECTICUT		
Agricultural Experiment Station, Univ. of Connecticut, Storrs.	23,806	23,364
DELAWARE		
Agricultural Experiment Station, University of Delaware	14,830	15,777
FLORIDA		
Agricultural Experiment Station, University of Florida	82,855	80,709
College of Veterinary Medicine, University of Florida	49,013	62,422
GEORGIA		
Agricultural Experiment Station, University of Georgia	29,647	23,855
College of Veterinary Medicine, University of Georgia	143,203	135,307
HAWAII		
Agricultural Experiment Station, University of Hawaii	7,943	7,822
IDAHO		
Agricultural Experiment Station, University of Idaho	64,687	56,445
College of Veterinary Medicine, University of Idaho	15,638	19,952
ILLINOIS		
Agricultural Experiment Station and College of Veterinary Medicine, University of Illinois	179,934	176,889
INDIANA		
Agricultural Experiment Station and School of Veterinary Medicine, Purdue University	123,252	114,861
IOWA		
Agriculture & Home Economics Experiment Sta., Iowa State Univ.	67,881	61,870
College of Veterinary Medicine, Iowa State University	258,524	258,247
KANSAS		
Agricultural Experiment Station and College of Veterinary Medicine, Kansas State University	184,651	179,892
KENTUCKY		
Agricultural Experiment Station, University of Kentucky	98,092	97,033
LOUISIANA		
Agricultural Experiment Station, Louisiana State University	80,562	76,365
School of Veterinary Medicine, Louisiana State University	30,042	26,149
MAINE		
Agricultural Experiment Station, University of Maine	18,102	16,840
MARYLAND		
Agricultural Experiment Station, University of Maryland	48,548	48,238
MASSACHUSETTS		
Agricultural Experiment Station, University of Massachusetts	10,620	10,136
School of Veterinary Medicine, Tufts University	51,016	45,747
MICHIGAN		
Agricultural Experiment Station and College of Veterinary Medicine, Michigan State University	103,969	99,713
MINNESOTA		
Agricultural Experiment Station, University of Minnesota	82,115	88,051
College of Veterinary Medicine, University of Minnesota	111,182	98,794
MISSISSIPPI		
Agricultural and Forestry Experiment Station and College of Veterinary Medicine, Mississippi State University	52,007	53,189

State/Recipient	Fiscal Year 1985 Actual	Fiscal Year 1986 Est.
MISSOURI		
Agricultural Experiment Station, University of Missouri	$73,452	$56,576
College of Veterinary Medicine, University of Missouri	67,853	97,702
MONTANA		
Agricultural Experiment Station, Montana State University	77,156	82,542
NEBRASKA		
Agricultural Experiment Station, University of Nebraska	193,987	188,963
NEVADA		
Agricultural Experiment Station, University of Nevada	17,365	18,066
NEW HAMPSHIRE		
Agricultural Experiment Station, University of New Hampshire	11,190	10,596
NEW JERSEY		
Agricultural Experiment Station, Rutgers University	26,978	22,328
NEW MEXICO		
Agricultural Experiment Station, New Mexico State University	41,159	41,890
NEW YORK		
Agricultural Experiment Station, Cornell University	51,250	56,463
College of Veterinary Medicine, Cornell University	221,233	221,667
NORTH CAROLINA		
Agricultural Experiment Station and School of Veterinary Medicine, North Carolina State University	100,061	104,647
NORTH DAKOTA		
Agricultural Experiment Station, North Dakota State University.	58,502	58,703
OHIO		
Ohio Agricultural Research and Dev. Center, Ohio State Univ.	70,716	73,176
College of Veterinary Medicine, Ohio State University	53,379	48,674
OKLAHOMA		
Agricultural Experiment Station and College of Veterinary Medicine, Oklahoma State University	125,298	116,285
OREGON		
Agricultural Experiment Station, Oregon State University	53,015	49,507
School of Veterinary Medicine, Oregon State University	42,804	45,512
PENNSYLVANIA		
Agricultural Experiment Station, Pennsylvania State Univ.	52,337	55,393
School of Veterinary Medicine, University of Pennsylvania	108,886	99,840
PUERTO RICO		
Agricultural Experiment Station, University of Puerto Rico	14,543	13,818
RHODE ISLAND		
Agricultural Experiment Station, University of Rhode Island	14,910	12,993
SOUTH CAROLINA		
Agricultural Experiment Station, Clemson University	23,555	22,666
SOUTH DAKOTA		
Agricultural Experiment Station, South Dakota State University.	96,112	92,610
TENNESSEE		
Agricultural Experiment Station and College of Veterinary Medicine, University of Tennessee	70,441	65,589
TEXAS		
Agricultural Experiment Station and College of Veterinary Medicine, Texas A&M University	346,564	363,698
UTAH		
Agricultural Experiment Station, Utah State University	57,344	52,077
VERMONT		
Agricultural Experiment Station, University of Vermont	18,298	17,422
VIRGINIA		
Agricultural Experiment Station and College of Veterinary Medicine, Virginia Polytechnic Institute and State Univ.	90,624	87,502
WASHINGTON		
Agricultural Experiment Station, Washington State Univ.	34,631	36,771
College of Veterinary Medicine, Washington State Univ.	116,010	109,219
WEST VIRGINIA		
Agricultural & Forestry Experiment Station, West Virginia Univ.	16,267	14,809
WISCONSIN		
Agricultural Experiment Station and College of Veterinary Medicine, University of Wisconsin	208,846	205,875
WYOMING		
Agricultural Experiment Station, University of Wyoming	43,265	42,368
Subtotal	5,474,304	5,427,300
Federal administration	230,400	229,000
Small Business Act	55,296	68,700
Total	5,760,000	5,725,000

Table 7
Competitive Research Grants
Proposals Submitted and Grants Awarded in Fiscal Year 1985

	Proposals Received	Dollars Requested	Grants Awarded	Dollars Awarded
Plant Biology				
Biological Stress	335	$54,829,193	60	$4,181,544
Genetic Mechanisms	126	30,589,611	44	3,860,000
Nitrogen Fixation	104	19,282,688	40	3,060,000
Photosynthesis	109	19,604,616	40	3,060,000
Soybeans	47	6,085,245	7	497,435
Acid Precipitation	63	7,922,802	11	667,409
Alcohol Fuels	45	5,087,089	6	518,562
Subtotal	829	143,401,244	208	15,844,950
Human Nutrition				
Nutrient Requirements	144	32,036,716	28	1,920,600
Animal Science				
Brucellosis	15	2,259,968	3	480,150
Reproductive Efficiency	176)	38,351,998)	13	2,400,750
Reproductive Physiology	)	)	8	1 440,450
Subtotal	191	40,611,966	24	4,321,350
Biotechnology				
Plant Growth and Development	132	30,055,000	25	2,225,000
Plant Molecular Biology	179	56,342,000	31	4,100,000
Responses to Biological Stress	145	37,458,188	30	3,100,000
Responses to Environmental Stress	112	25,544,380	17	2,000,000
Animal Growth and Development	151	43,729,109	26	3,400,000
Animal Molecular Biology	171	64,663,000	37	4 381,000
Subtotal	890	257,791,677	166	19,206,000
Pest Science				
Gypsy Moths	41	9,250,203	7	960,300
Boll Weevil/Bollworm	38	6,105,295	9	960,300
Pine Bark Beetle	20	4,019,849	7	960,300
Subtotal	99	19,375,347	23	2,880,900
TOTAL	2,153	493,216,950	449	44,173,800

	Proposals Received	Dollars Requested	Grants Awarded	Dollars Awarded
Land-Grant Universities	1,420	$300,709,579	289	$28,890,315
SAES	(1,094)	(224,448,376)	(212)	(21,667,385)
Non-SAES	(326)	(76,261,203)	(77)	(7,222,930)
Land-Grant 1890	4	1,076,711	--	--
Private Universities	143	44,382,875	45	4,331,790
Other Public Universities	231	58,629,292	39	3,607,508
Federal Laboratories	9	2,951,899	4	345,000
USDA/ARS	147	28,590,323	32	2,798,355
Private Non-Profit	72	19,378,953	19	1,343,482
Private Profit	11	3,781,149	1	10,000
State and Local Agencies	2	345,878	3	403,900
Veterinary Schools and Colleges	110	31,933,738	17	2,443,450
Other	4	1,436,553	--	--
TOTAL	2,153	493,216,950	449	44,173,800

TABLE 1
DISTRIBUTION OF FEDERAL PAYMENTS FOR RESEARCH AT STATE AGRICULTURAL EXPERIMENT STATIONS AND OTHER STATE INSTITUTIONS - FISCAL YEAR 1985

STATE	HATCH ACT, AS AMENDED			COOP. FORESTRY RESEARCH (M-S)	1890 COLLEGES & TUSKEGEE INSTITUTE	ANIMAL HEALTH & DISEASE RESEARCH	SPECIAL RESEARCH GRANTS	COMPETITIVE RESEARCH GRANTS	1890 RESEARCH FACILITIES	HIGHER EDUCATION GRANTS	FORESTRY COMPETITIVE GRANTS	FEDERAL ADMIN. (DIRECT APPRO.)	TOTAL FEDERAL FUNDS
	REGULAR FORMULA	REGIONAL RESEARCH	TOTAL										
ALABAMA	2,663,864	735,187	3,399,051	420,001	2,664,781	127,580	443,193	61,500	2,200,000	334,962	0	0	9,651,068
ALASKA	725,080	124,691	849,771	198,660	0	9,318	5,000	0	0	0	0	0	1,062,749
AMERICAN SAMOA	114,529	0	114,529	0	0	0	0	0	0	0	0	0	114,529
ARIZONA	997,393	659,300	1,656,693	230,280	0	57,164	238,491	561,000	0	24,140	85,234	0	2,853,002
ARKANSAS	2,288,611	644,321	2,932,932	380,476	1,164,970	78,085	380,160	276,310	443,820	107,778	0	0	5,764,531
CALIFORNIA	2,971,526	1,389,794	4,361,320	412,096	0	441,374	1,577,845	5,665,450	0	804,079	672,465	0	13,934,629
COLORADO	1,343,154	948,231	2,291,385	214,471	0	230,633	267,772	611,031	0	183,040	187,180	0	3,985,512
CONNECTICUT	1,131,423	430,016	1,561,439	143,325	0	23,806	302,434	462,605	0	82,090	0	0	2,575,699
DELAWARE	783,366	321,669	1,105,035	80,085	454,743	14,830	5,000	90,000	350,280	107,778	0	0	2,207,751
DIS. OF COLUMBIA	209,885	89,723	299,608	0	0	0	0	318,000	0	107,778	0	0	725,386
FLORIDA	1,878,681	584,433	2,463,114	340,950	930,447	131,868	1,329,963	1,401,038	238,280	304,794	0	0	7,140,454
GEORGIA	2,963,356	975,035	3,938,391	427,905	1,463,272	172,850	210,314	1,084,919	700,000	177,445	93,956	0	8,269,052
GUAM	607,428	102,605	710,033	0	0	0	319,400	0	0	0	0	0	1,029,433
HAWAII	776,512	331,103	1,107,615	95,895	0	7,943	1,723,868	210,000	0	11,551	0	552,210	3,709,082
IDAHO	1,259,355	519,803	1,779,158	301,425	0	80,325	396,548	100,000	0	0	0	0	2,657,456
ILLINOIS	3,747,272	886,562	4,633,834	182,850	0	179,934	515,021	2,066,972	0	288,137	0	0	7,866,748
INDIANA	3,420,255	737,053	4,157,308	214,471	0	123,252	988,403	1,675,300	0	168,483	122,015	0	7,449,232
IOWA	3,574,766	1,254,954	4,829,720	127,515	0	326,405	737,248	1,187,327	0	267,531	0	0	7,475,746
KANSAS	2,190,742	728,828	2,919,570	111,705	0	184,651	109,231	537,650	0	99,706	0	192,060	4,154,573
KENTUCKY	3,466,343	732,811	4,199,154	277,711	1,546,475	98,092	111,824	1,079,769	286,360	107,777	181,949	0	7,889,111
LOUISIANA	2,116,661	608,181	2,724,842	388,380	1,063,445	110,604	153,406	185,000	433,920	107,778	482,304	0	5,649,679
MAINE	1,105,867	448,186	1,554,053	364,665	0	18,102	80,367	111,000	0	0	460,801	0	2,588,988
MARYLAND	1,526,180	566,590	2,092,770	174,945	778,685	48,548	25,799	1,038,200	232,520	283,177	147,663	0	4,822,307
MASSACHUSETTS	1,335,589	550,473	1,886,062	159,136	0	61,636	59,775	1,893,417	0	263,060	125,394	0	4,448,480
MICHIGAN	3,451,255	775,947	4,227,202	372,573	0	103,969	1,627,511	1,056,500	0	168,965	540,109	0	8,096,829
MICRONESIA	478,591	0	478,591	0	0	0	0	0	0	0	0	0	478,591
MINNESOTA	3,366,438	855,395	4,221,833	309,330	0	193,297	691,326	1,579,200	0	182,016	273,658	0	7,450,660
MISSISSIPPI	2,763,196	764,848	3,528,044	404,190	1,190,853	52,007	4,868,679	367,800	377,220	147,032	100,826	456,105	11,492,756
MISSOURI	3,252,533	691,088	3,943,621	261,900	1,548,125	141,305	803,821	1,486,000	545,760	292,133	0	0	9,022,665
MONTANA	1,191,666	582,149	1,773,815	253,995	0	77,156	213,175	50,000	0	0	0	0	2,368,141
NEBRASKA	2,025,262	796,402	2,821,664	103,800	0	193,987	338,814	392,000	0	111,502	0	0	3,961,767
NEVADA	717,126	318,741	1,035,867	72,180	0	17,365	5,000	490,700	0	0	0	0	1,621,112
NEW HAMPSHIRE	894,120	322,344	1,216,464	190,755	0	11,190	15,267	207,000	0	0	0	0	1,640,676
NEW JERSEY	1,313,172	940,634	2,253,806	151,230	0	26,978	490,969	589,000	0	0	0	0	3,511,983
NEW MEXICO	1,029,337	350,692	1,380,029	167,040	0	41,159	106,657	0	0	0	0	0	1,694,885
NEW YORK	3,313,677	1,381,865	4,695,542	333,045	0	272,483	823,061	4,054,893	0	197,016	132,479	0	10,508,519

STATE	HATCH ACT, AS AMENDED			COOP. FORESTRY RESEARCH (M-S)	1890 COLLEGES & TUSKEGEE INSTITUTE	ANIMAL HEALTH & DISEASE RESEARCH	SPECIAL RESEARCH GRANTS	COMPETITIVE RESEARCH GRANTS	1890 RESEARCH FACILITIES	HIGHER EDUCATION GRANTS	FORESTRY COMPETITIVE GRANTS	FEDERAL ADMIN. (DIRECT APPRO.)	TOTAL FEDERAL FUNDS
	REGULAR FORMULA	REGIONAL RESEARCH	TOTAL										
NORTH CAROLINA	4,499,525	1,054,252	5,553,777	396,285	2,113,723	100,061	421,654	1,613,889	800,000	255,540	247,801	0	11,502,730
NORTH DAKOTA	1,506,678	521,371	2,028,049	56,370	0	58,502	473,775	0	0	0	0	0	2,616,696
OHIO	4,088,829	837,821	4,926,650	246,090	0	124,095	884,464	1,098,938	0	109,926	0	0	7,390,163
OKLAHOMA	2,091,193	528,675	2,619,868	222,375	885,165	125,298	652,455	180,000	305,960	288,375	0	0	5,279,496
OREGON	1,570,265	824,514	2,394,779	443,715	0	95,819	2,026,479	1,003,069	0	36,288	751,335	0	6,751,484
PENNSYLVANIA	4,069,898	1,065,438	5,135,336	317,236	0	161,223	938,449	1,341,895	0	68,508	341,217	0	8,303,864
PUERTO RICO	2,984,682	654,647	3,639,329	48,465	0	14,543	505,732	0	0	0	0	0	4,208,069
RHODE ISLAND	717,763	320,836	1,038,599	64,275	0	14,910	44,700	231,000	0	49,254	0	0	1,442,738
SOUTH CAROLINA	2,315,636	607,150	2,922,786	325,141	996,166	23,555	510,468	90,000	249,020	124,195	187,000	0	5,428,331
SOUTH DAKOTA	1,546,673	525,791	2,072,464	87,990	0	96,112	113,710	0	0	45,672	0	0	2,415,948
TENNESSEE	3,336,109	752,743	4,088,852	285,615	1,604,740	70,441	307,560	250,266	519,460	130,614	0	0	7,257,548
TEXAS	4,302,357	1,070,771	5,373,128	348,856	2,046,513	346,564	1,556,549	1,843,000	1,400,000	370,466	150,000	0	13,435,076
UTAH	905,427	600,852	1,506,279	135,420	0	57,344	265,384	431,800	0	11,418	315,234	0	2,722,879
VERMONT	949,695	284,292	1,233,987	214,471	0	18,298	133,030	130,000	0	0	0	0	1,729,786
VIRGIN ISLANDS	527,973	105,322	633,295	0	0	0	188,800	0	0	0	0	0	822,095
VIRGINIA	2,848,955	709,900	3,558,855	356,760	1,386,121	90,624	158,047	901,762	517,400	153,450	360,392	0	7,483,411
WASHINGTON	1,789,696	1,179,760	2,969,456	435,811	0	150,641	1,079,633	1,729,100	0	65,672	514,060	0	6,944,373
WEST VIRGINIA	1,809,217	468,633	2,277,850	269,806	0	16,267	5,000	0	0	0	0	0	2,568,923
WISCONSIN	3,375,855	938,220	4,314,075	293,520	0	208,846	425,378	2,439,500	0	98,508	1,055,680	0	8,835,507
WYOMING	850,710	487,872	1,338,582	119,610	0	43,265	101,800	0	0	52,366	0	0	1,655,623
OTHER	0	208,700	208,700	0	36,800	0	0	0	0	0	0	0	245,500
SMALL BUSINESS													
SET ASIDE	1,152,753	362,881	1,515,634	126,614	227,698	55,296	310,691	446,200	0	0	76,048	12,125	2,770,306
SUBTOTAL	114,234,100	36,260,095	150,494,195	12,661,410	22,102,722	5,529,600	31,069,100	44,620,000	9,600,000	6,790,000	7,604,800	1,212,500	291,684,327
UNOBLIGATED													
BALANCE	1,041,208	27,968	1,069,176	0	667,058	0	1,164,000	0	0	0	0	0	2,900,234
SUBTOTAL	115,275,308	36,288,063	151,563,371	12,661,410	22,769,780	5,529,600	32,233,100	44,620,000	9,600,000	6,790,000	7,604,800	1,212,500	294,584,561
FEDERAL ADMIN.			4,429,045	391,590	704,220	230,400	960,700	1,380,000	400,000	210,000	235,200	262,500	9,203,655
UNOBLIGATED													
BALANCE			15,584	0	0	0	36,200	0	0	0	0	0	51,784
SUBTOTAL			4,444,629	391,590	704,220	230,400	996,900	1,380,000	400,000	210,000	235,200	262,500	9,255,439
PENALTY MAIL			450,240										450,240
SMALL BUSINESS													
SET ASIDE			4,760										4,760
UNOBLIGATED													
BALANCE			21,000										21,000
SUBTOTAL			476,000										476,000
TOTAL	115,275,308	36,288,063	156,484,000	13,053,000	23,474,000	5,760,000	33,230,000	46,000,000	10,000,000	7,000,000	7,840,000	1,475,000	304,316,000

SMALL BUSINESS INNOVATION RESEARCH PROGRAM

The Small Business Innovation Development Act, Public Law 97-219, July 22, 1982, was designed to strengthen the role of small, innovative firms in Federally funded research and development. It directs that small firms receive at least a fixed minimum percentage of research and development awards made by Federal agencies with sizable research and development budgets. In fiscal year 1983, 0.2 percent of an agency's extramural research budget was set aside for purposes of the SBIR Act. In fiscal year 1984 the set aside increased to 0.6 percent, in fiscal year 1985 to 1.0 percent, and in fiscal year 1986 and all subsequent fiscal years to 1.25 percent. The following table represents the set aside by agency for the Department of Agriculture:

Agency	FY 1985 Actual	FY 1986 Estimate	FY 1987 Estimate
Agricultural Cooperative Service	$7,000	$6,250	- -
Agricultural Research Service	245,000	150,000	$150,000
Cooperative State Research Service ..	2,775,066	3,323,002	2,838,441
Economic Research Service	16,000	19,638	12,500
Forest Service	79,000	40,000	37,500
Human Nutrition Information Service .	23,000	93,750	18,750
Statistical Reporting Service	5,880	7,575	5,625
Total	3,150,946	3,640,215	3,062,816

The functions of the SBIR program, the solicitation, review and evaluation of proposals have been centralized in order to most effectively and efficiently serve the SBIR community. A committee composed of members of each contributing agency established six research topic areas:

1. Forest and Related Resources. Proposals were solicited to develop environmentally sound techniques to increase productivity of forest land and to increase the utilization of materials and resources from forest lands.

2. Plant Production and Protection. Research proposals were solicited to find ways to increase crop productivity so that effective and efficient food production and agricultural systems can be developed and strengthened.

3. Animal Production and Protection. Research proposals were solicited to find ways to enable producers to increase production and to assure a reliable and safe supply of animal protein while conserving resources and reducing production costs.

4. Air, Water and Soils. Research proposals were solicited to develop technology for using and conserving soil, water and air resources while sustaining optimum agricultural productivity.

5. Food Science and Nutrition. Research proposals were solicited in the area of food quality and safety and in those areas that address the reduction of post-harvest loss. In addition, research proposals were solicited that dealt with the assessment of the adequacy of nutrient intake.

6. Rural and Community Development. Research proposals were solicited to find ways to develop business opportunities in rural areas and to look for innovative ways to manage small rural business.

In response to the March 15, 1985, deadline announced in the Federal Register the Department of Agriculture received 314 proposals from small businesses that had innovative approaches to solve problems in U.S. agriculture. The agency contributions were pooled and grants were made without regard to the funding source. The proposals were peer reviewed and many high quality applications were identified. With the funds available for the program 34 awards could be made. A summary of the fiscal year 1985 solicitation follows:

Program Area	Number of Proposals Received	Amount Requested	Number of Grants Awarded	Amount of Awards
Forest and Related Resources.....	50	$2,787,430	6	$623,266
Plant Production and Protection ..	91	5,091,445	7	778,990
Animal Production and Protection..	61	2,665,302	4	189,857
Air, Water and Soils	34	2,168,332	3	299,508
Food Science and Nutrition	38	2,164,062	8	723,334
Rural and Community Development ..	40	2,072,060	6	535,991
Total	314	16,948,631	34	3,150,946

COOPERATIVE STATE RESEARCH SERVICE

STATUS OF PROGRAM

The funds appropriated for Cooperative State Research Service (CSRS) provide the Federal Government's support for land-grant agricultural experiment stations, approved schools of forestry, the 1890 land-grant institutions and Tuskegee University, colleges of veterinary medicine and other eligible institutions in the various States and in Puerto Rico, Guam, the Virgin Islands, the District of Columbia, American Samoa, Micronesia, and Northern Mariana Islands.

The State institutions conduct research and experiments on the problems continuously encountered in the development of a permanent and sustaining agriculture and forestry, and in the improvement of the economic and social welfare of rural and urban families. Because of differences in climate, soil, market outlets, and other local conditions, each State has distinct problems in the production and marketing of crops and livestock. Farmers, foresters, and rural people in the individual States naturally look to their State Agricultural Experiment Stations, universities, and colleges for solution of the State and local problems and request services to help meet changing conditions.

Research programs at State institutions, to be most effective, include participation in regional and national programs. Joint effort by a group of State institutions is the most effective and often the only practical approach to problems of common interest. The stations are acting together as regional groups to provide cooperative coordinated attacks on problems of regional and national interest. In a similar manner, the research programs of the State institutions and the Department of Agriculture are complementary and interdependent.

The Federal formula funds constitute a powerful force in bringing about inter-State cooperation and Federal-State collaboration in the planning and conduct of this overall program of agricultural research. Therefore, the impact of the Federal formula funds cannot be fully evaluated solely on the basis of the amount of funds provided.

Research at the State institutions is organized into a program of projects that is submitted for approval by the Cooperative State Research Service. The program of projects is financed wholly or in part from Federal formula and grant funds. Programs and projects are evaluated periodically with station scientists by administrators and technical staff of the Cooperative State Research Service. The evaluation includes consideration of quality and productivity of the program and projects. The continuing process of research evaluation by station scientists and the staff of the Cooperative State Research Service results in a dynamic program with approximately 15 to 20 percent of the projects being replaced by new and/or revised projects each year.

PAYMENTS UNDER THE HATCH ACT

The Hatch program of research at the State Agricultural Experiment Stations is aimed at improving rural living conditions, conserving resources, and promoting efficient production, marketing, distribution, and utilization of crops and livestock essential to the food supply or health and welfare of the people of the United States.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds:

1. NATURAL RESOURCES

Current activities: 10 percent of total Hatch funds for research. Included are soil and land use, water and watersheds, outdoor recreation, environmental quality, fish and wildlife, and remote sensing.

Selected examples of recent progress:

New Procedures to Measure Loss of Nitrogen from Soil. Scientists at the University of Illinois have perfected procedures for determination of dinitrogen (N_2) and nitrous oxide (N_2O) evolved from soils treated with nitrogen fertilizer labeled with a stable isotope of nitrogen. Results indicate these gases originate largely through denitrification of nitrate ions under anaerobic conditions, that they evolve concurrently, and that more N_2 is usually evolved than N_2O. The evolution of these gases appears to follow an overall cycle associated with wetting and drying of the soil. Very little N_2 and N_2O is evolved when the soil moisture content is above field capacity and it eventually ceases when the soil is saturated by rainfall. It subsequently increases as the soil dries, with maximum evolution occurring several days after the rainfall. This work has important implications, with respect to the fate of nitrogen applied to soil, that could lead to more efficient use of costly fertilizers.

Degradation of Toxic Chemicals by Anaerobic Bacteria. Michigan Agricultural Experiment Station scientists have found bacteria in various anaerobic habitats such as sediments and sludge digestors that are capable of degrading chlorinated aromatic compounds. The process employs a unique reaction in which chlorine is removed directly from the aromatic ring. This degradative step, referred to as reductive dechlorination, is significant because it does not appear to occur in aerobic habitats and because the dechlorinated products are less toxic and more susceptible to further biodegradation. The chemicals degraded by these bacteria so far, include such toxic compounds as 2,4,5-T and pentachlorophenol (PCP). These bacteria may also be capable of degrading such troublesome pollutants as dioxins, PCB's and trichloroethylene (TCE).

Decontamination of Soil by Formation of Bound Residues. Soils contaminated by recalcitrant organic pollutants are extremely difficult to manage. Two approaches have been used in the majority of cases: containment with clay barriers or excavation of the contaminated soil. The effectiveness of these processes is limited by lengthy periods of time required for their execution and by the enormous expense involved. Michigan soil scientists believe that with certain types of contaminants it may be possible to detoxify soil in place by enhancing the attachment of certain hazardous organic chemicals to soil humic constituents. This process essentially obliterates the chemical identity of the pollutant and effectively diminishes its bioavailability. This novel approach depends on manipulating the natural ability of soil to act as a medium for decontaminating toxic man-made chemicals. They have evidence that additions of certain simple phenolic humus constituents to soil accelerate the natural process of humus formation which leads to the formation of bound residues in soil. This approach appears to have promise as a rapid and inexpensive method for the containment of hazardous contaminants in soil.

Computer Systems for Soil Data. Pennsylvania State University researchers are developing a system that will make a variety of soil data available to users of personal computers. The data can be used for research on the soil characteristics, interpretations, and their distribution, to improve the evaluation of soils for crop management decisions and to enable comprehensive land analysis for planning and resource management. Computers have been used at Pennsylvania State since 1966 to organize and retrieve and analytical soil data. The data now represent over 5,500 soil samples from 620 locations in Pennsylvania. They also include soil mapping information from almost every Pennsylvania county plus soil characteristics data from the U.S. Soil Conservation Service. The information in this data base can be sent to users through computer networks.

New method for Soil Moisture Measurement. Soil scientists have several ways to measure soil moisture, but all have some disadvantages. A new method using infrared light and optical fiber technology has been successfully researched. The originators at the North Dakota State University, believe the new technique has great potential for overcoming at least some of the limitations of the past. In principle, the sensors can be made extremely small--much less than 1 mm^3 in volume. No maintenance is required after installing the sensors in the soil, and freezing should not bother them. Simultaneous measurement of some of the chemical properties of the soil solution should be possible with further development. Cost of the sensors is low because they are constructed from readily available, low cost materials.

Prototype Furnance for Burning Corn Cobs. Research conducted by agricultural engineers at the Ohio Agricultural Research and Development Center has led to the development of a prototype fluidized bed combustor that burns corncobs without pollution, delivers more than 60 percent of the fuel energy as clean high temperature air, and eliminates the "plugging" problem experienced with conventional furnances. Twelve tons of corncobs (the production from about 10 acreas of corn), when burned in the combustor, produce about as much energy as 980 gallons of fuel oil. A small turbocharger-driven generator connected to the combustor was also used to generate electricity. It was also found that the combustor would burn shelled corn and that 56 pounds of corn had an energy content eqivalent to 4.2 gallons of propane. Therefore, the value of the heat energy in shelled corn would be $3.00 when compared to propane at 85 cents per gallon. The combustor could possibly be adapted to burn Ohio's high sulphur coal with virtually no pollution. The possibility exists that such a combustor could render Ohio farmsteads energy self-sufficient.

Laser Technology for Study of Soil Erosion Process. Agricultural engineers at the University of Tennessee have developed circuitry and computer software to process rainfall data from a laser spectrometer interfaced with a computer. The system allows the engineers to study how rainfall energy relates to soil particle detachment and removal from the soil mass. Increased understanding of the erosion process should aid in identifying soil management techniques and farming practices which protect soils from eroding, avoid reduced productivity and reduce waterway pollution.

2. FOREST RESOURCES

Current activities: 2 percent of total Hatch funds for research. Forestry related research under Hatch is closely coordinated with McIntire-Stennis Cooperative Forestry Research program which has similar research objectives. The Hatch forestry research program is characterized by a high degree of multi-institutional or regional projects.

Selected examples of recent progress:

Chemical Feedstock from Juvenile Hardwoods Planted on Marginal Land in Illinois. University of Illinois scientists found that planting site, tree spacing, and wood species caused significant variations in the chemical properties of five species (black locust, black alder, autumn olive, eastern cottonwood, and sycamore) of three-year-old deciduous trees. Trees grown on bottomland sites gave significantly higher values for chemical extractives. Trees grown on upland sites gave higher production of lignin, pentosan, and holocellulose. The narrow spaced (9" x 9") trees gave higher values for pentosan content. Wide spaced (12" x 18") trees gave significantly higher values of extractives, lignin, and alpha-cellulose content. In comparing among species, cottonwood was found to have the highest extractives and ash content. Autumn olive had the highest lignin content. Black locust had the highest alpha-cellulose. Sycamore had the highest content of pentosan. These data add to the base needed to establish this renewable resource as a viable future chemical feedstock.

3. CROP RESOURCES

Current activities: 40 percent of total Hatch funds for research. Included under the research program are crop protection and production systems for dependable and efficient production, quality improvement, quality maintenance, product development, and related commodity aspects of marketing of crops.

Selected examples of recent progress:

Reducing Production Costs by Decreasing Energy Requirements. Research conducted by agricultural engineers at the University of California at Davis has shown that energy use in agricultural drying methods could be reduced 25 to 50 percent by improving moisture measuring techniques, increasing air circulation and proper burner installation. Introduction of the procedures by California walnut farmers, and prune dehydrator operators, with the assistance of Cooperative Extension agricultural engineers, has resulted in savings of annual fuel costs of $250,000 and $1.5 million, respectively. Research conducted by agricultural engineers of the North Carolina Agricultural Research Service has resulted in the development of methods which reduce energy requirements for drying peanuts 25 to 30 percent and at the same time result in reduced time for drying and in a product with slightly higher market value when compared with conventional methods of drying peanuts. This has been accomplished by the development and utilization of improved methods of control and partial recirculation of the drying air.

Anti-Transpirants Enhance Vegetable Emergence, Growth, and Production. Germination, emergence and growth of small-seeded and shallow-rooted vegetables are difficult problems in the semi-arid regions of the United States because moisture evaporates so quickly. In the Texas High Plains, as many as four to eight irrigations may be required for seedling emergence. Researchers at the Texas Agricultural Experiment Station investigated chemicals and natural materials that would modify soil and leaf surfaces to reduce moisture loss. An inexpensive, natural animal fat emulsion, was developed that can be sprayed under practical field conditions. The emulsion acts as a moisture seal and, when applied to the soil surface, enhances germination and growth of small-seeded vegetables. The number of irrigations required for germination and emergence was reduced to one. In addition, the emergence of onion and pepper sprouts in irrigated plots was 7 to 12 days earlier for the fat emulsion treatment plots.

When sprayed on potato plant foliage, the natural fat emulsion worked as well as commercial chemical anti-transpirants and increased the yield of larger potatoes--those weighing over 8 ounces. The use of fat emulsion is not only cost-effective, but prevents the soil from crusting over from repeated irrigations and rapid evaporation. The procedure has been adopted by commercial farms in Texas, and has been tried by farmers in a number of other States, including North Dakota, Colorado, and Florida.

Cotton Wilt Factor Found. University of Arizona scientists have discovered that cotton plants that have cotton fungus root rot disease (Phymatotrichum omnivorum) have a decreased water flow in roots and stems and soon wilt. A substance produced by this microbe can plug the water conducting vessels in cotton plants, thus causing wilting. A simular substance has been isolated from root rot-infected field cotton but not from healthy plants. Cotton seedlings wilt within 4 hours when placed in water containing small quantities of this plug-substance. Thorough chemical analysis has not been completed, but the substance is known to be a large, complex molecule made up of sugars and proteins. Future cotton selection may aim toward cultivars with vessels which are not easily clogged by these elusive, wilt-inducing substances.

Potato Micro-propagation. Scientists have searched for years for a way to control Blackleg in potatoes. The generally accepted theory has been that the potato plant was infected with the Blackleg organism through contaminated soil. Scientists at Colorado State University learned that, rather than soil-borne, this pathogen is spread through seed stock. Once this was established, procedures were developed to produce disease-free seed potato stock in large quantities. The technique of micro-propagation, refined and promoted by the University through a demonstration program, has made it possible to introduce disease-free plant material to commercial potato producers in the State. More than 51,000 acres of potatoes are harvested annually in Colorado. Research has allowed producers to harvest a higher percentage of high quality potatoes for seed production, the manufactured market and as fresh table stock. The widespread acceptance of micro-propagation of potato seed stock has been instrumental in the revision and updating of procedures for seed potato certification. The process also has helped speed up the process of developing new and improved potato varieties.

Pollen as a Vector for DNA Transfer. Researchers at the Illinois Agricultural Experiment Station recently developed a procedure by which segments of genetic code of wild corn relatives are incorporated into the DNA of pollen of common corn inbreds. By using this pollen to pollinate standard inbreds, they are able to introduce unique characteristics, such as leaf rust resistance, into domestic hybrids in one or two generations, in contrast to the eight to fifteen generations required by conventional plant breeding techniques. An important advantage of this system of transferring genes is that individual traits can be transferred from a donor to a recipient genome in one generation without upsetting the equilibrium of the recipient genome.

Disease Resistance in Plants. Research at Michigan State University over several years has established several concepts that help to understand infections in plant diseases. Toxic compounds with unusual characteristics are involved in some destructive diseases. Certain parasitic fungi produce low molecular weight toxins that selectively affect the host plant; nonhosts are tolerant. The toxins have diverse chemical structures. Genetic and other data show that plant resistance to each fungus is based on tolerance to its toxin. In the fungi, the same genes control toxin production and

ability to cause disease. Plant breeders have used these toxins to screen for disease resistance, and there is widespread interest in using them in cell culture research. Perhaps the greatest potential will be in genetic engineering, once the techniques for gene transfer in higher plants are perfected. These gene manipulations promise to greatly expand sources of disease resistance in plants.

Insect Pest Management for Vegetable Crops. A biological control technique has been devised at the University of Tennessee, to supress the Mexican bean beetle on snapbean plots using mass releases of the predaceous spined soldier bug. This predator has been successfully reared through 28 generations in the laboratory, where resulting consumption and longevity tests indicate its high potential as an effective control agent. Immature bugs feed on pests for about 21 days, with each predator having a potential of consuming 75 to 100 Mexican bean beetles. Upon reaching adulthood, most of the predators released disperse due to overcrowding, thus providing additional pressure on other insect pests in the area. Use of this biocontrol agent to suppress and maintain pest populations at low levels provides the grower with a feasible alternative to insecticides. Due to the simplicity of the technique for rearing the predator, and availability of the predator, growers should have no difficulty in obtaining sufficient numbers to make mass releases of the spined soldier bug during the growing season.

Drouth-Tolerant Sorghum and Millet. Traditional grain sorghum production in Arizona requires approximately 26 inches of water. However, research at the University of Arizona, using a gradient irrigation system has revealed some cultivars that produce heads with viable seed using only 10 to 12 inches of irrigation water. This was accomplished by using a sprinkler system that delivers soil moistures that range from optimum to no water after germination. In order to find drouth-tolerant strains, more than 3,000 different kinds were screened over a six-year period from the major sorghum-millet growing areas of the world. The gradient irrigation system is an excellent screening tool that identifies plants carrying drouth-tolerant genes. It will help provide marginal agricultural areas of the world with food producing varieties of sorghum and millet.

Expression of Latest Genetic Information for Disease Resistance in Plants. Research at the Kentucky Agricultural Experiment Station has provided biological and chemical evidence to support the hypothesis that all plants contain the genetic potential for resistance mechanisms to fungal, bacterial and viral diseases. The determinant of resistance appears to be the speed and magnitude with which this potential is expressed and the effect of the environment on the activity of gene products. Working with green bean, tobacco, cucumber, watermelon and muskmelon, the researchers have demonstrated that plants may be systemically immunized against diseases caused by fungi, bacteria and viruses using restricted infection with fungi, bacteria, or viruses. Immunization protects cucumber, watermelon, muskmelon and tobacco throughout the season, and a single immunization protects cucumber against at least 12 unrelated diseases.

4. ANIMAL RESOURCES

Current activities: 28 percent of total Hatch funds for research. Included under this research program grouping are protection, production and management of beef and dairy cattle, swine, sheep, other animals, poultry, and aquaculture. It also includes quality improvement, product development, and related commodity aspects of marketing.

Selected examples of recent progress:

New Parasitic Disease of Sheep Identified. Oregon scientists have found sheep in that State infected with the parasite known as Nematodirus battus. This is the first report of that parasite in the United States and the Western Hemisphere. The significance of this finding is that in Britain, where the parasite has been known to occur, it is considered the most pathogenic internal parasite of those affecting young lambs. Mortality in some flocks can range up to 75 percent. Studies are being made by the Oregon scientists to further determine the extent of the parasite infection in local areas and to assess the potential for losses of sheep. Early detection of foreign pathogens, such as this parasite, is extremely important in protecting our livestock from devastating foreign disease agents.

An Automated System for Testing Disease Resistance in Poultry. An automated system for monitoring the level of antibodies that protect against the major respiratory diseases of poultry has been developed by Pennsylvania scientists. The system can quickly and accurately perform large numbers of test at low cost and, therefore, is ideally suited for monitoring the status of disease resistance in large commercial poultry flocks. The recent devastating outbreak of avian influenza demonstrates the need for rapid, reliable techniques to assess the disease and immunity status of poultry flocks. The system developed by these scientists uses a highly sensitive and accurate test (ELISA) combined with computer-operated equipment to identify and quantify circulating antibodies in poultry. It is anticipated that this new system will find immediate application in assisting to reduce an annual loss of more than $370 million due to poultry respiratory diseases.

The Potential for Extending World Protein Supplies. Dietary proteins are thought to be hydrolyzed in the digestive tract and the free amino acids from these absorbed, transported and utilized by animals to meet body needs for maintenance and production. The form(s) in which these amino acids are absorbed, transported and utilized by various tissues seems less certain than once thought. Animal science researchers at Virginia Polytechnic Institute and State University observed that amino acids may be absorbed primarily as peptides. Approximately 75% of the amino acids appearing in the portal plasma of calves are in the form of small peptides. Whether these are of dietary origin has not yet been established. It has also been observed that once amino acids are absorbed, they may be transported from tissue to tissue in a variety of forms. They may be transported in plasma as free amino acids, peptides and proteins. The nutritional state of the animal, the amino acid and the particular tissue mass being studied seem all to be involved with determining which of these forms of transport is most important. This research has great potential to help explain the complex nature of protein nutrition, define dietary forms in which amino acids are best supplied, and increase the efficiency of animal feeding.

Harvest System for Freshwater Prawns. Agricultural engineering researchers at the University of Hawaii have developed a new, selective harvest system for freshwater prawns that produces consistently high harvest efficiency and yield. A mechanically pulled net system includes a low cost and light weight boom to replace the harvest crew in the pond. Segments of the net are attached and fastened by nylon zippers, which are also used as closing mechanism to increase harvest efficiency. The efficiency of harvesting prawns with the new system in earthen ponds is approximately 63 percent, compared to previous estimates of 25 percent efficiency using traditional net harvesting methods. The new harvest system also significantly reduces both the time and effort required by harvesting methods currently employed by the prawn industry. Average yields of 2,000 pounds per acre per year can now be achieved, compared to the average yield for Hawaii in 1983 of about 1,200 pounds per acre per year.

Easier Methods for Freezing Embryos. On-farm procedures for superovulation, insemination, flushing and transferring of embryos from genetically outstanding cows have grown rapidly in the dairy industry. However, large variation is seen in the number of transferrable embryos resulting from these procedures and the number of cows prepared to receive the embryos is often insufficient. Therefore, many genetically important embryos are not transferred and, thus, are wasted. The freezing of excess embryos has become an important means of decreasing the wastage of these valuable embryos. Simplified, on-farm embryo freezing procedures show promise. Research at the University of Georiga has shown that embryos added directly to the freezing protectant survived freezing as well as embryos which underwent a more complex and time consuming gradual addition of the freezing protectant. The research also demonstrated that an inexpensive, totally portable freezer could be used successfully for freezing embryos. These advances in the freezing of embryos may help decrease the number of valuable embryos which are wasted by making embryo freezing easier and the equipment more portable for use anywhere.

Endocrine Manipulation May Increase Meat Production. Researchers at the Pennsylvania State University have been studying the administration of growth hormone as a means for improving the growth performance of meat animals. They have concluded that developing a new generation of growth hormone products will lead to a dramatic increase in the economic efficiency of meat-animal agriculture. Genetic selection of meat animals has led to a marked increase in growth performance, but has not reached the animals' full biological potential. The researchers have found that daily administration of exogenous porcine growth hormone improves nutrient partitioning by swine: the amount of fat tissue decreases, while muscle mass and feed efficiency increases. Treating swine for 30 days increased feed efficiency about 20 percent. By considering the number of swine marketed annually in the United States and the amount of feed they consume, the researchers estimate that such an increase in feed efficiency means a savings of $1 billion to $3 billion per year.

5. PEOPLE, COMMUNITIES, AND INSTITUTIONS (INCLUDING RURAL DEVELOPMENT)

Current activities: 6 percent of total Hatch funds for research. Included under this research program grouping are individuals and families, living environment, and communities, institutions and services.

Selected examples of recent progress:

Independent Living Rehabilitation for Persons with Severe Disabilities. One in seven Americans has a physical or mental disability with arthritis and rheumatism ranking first among the causes. The cost of maintenance of disabled people from public and/or private funds is over $180 billion annually. Independent living rehabilitation has been the focus of an ongoing project at the University of Nebraska, dealing with ways in which low-cost technology can make independent living a viable alternative for severely disabled persons. A language prosthesis has been designed for disabled people who cannot express themselves through speech or hand signs. It is a semantic interphase that uses a microprocessor. With a keyboard of less than 50 keys, this device can produce thousands of clear, spoken sentences with fewer than seven strokes. When families of disabled persons were studied to determine their coping abilities, females were found to utilize such coping mechanisms as building relationships with others who have similar problems and getting away for their own interest. Males usually found help in family discussions, trusting other family members and in gainful employment outside the home.

Anthropometry of School Children. In a University of Hawaii study of more than 14,000 children attending kindergarten through ninth grade in Hawaii, Samoan children were significantly taller, while Japanese, Filipino, Chinese, and Korean children were slightly shorter than mainland children. Caucasian, Hawaiian and part-Hawaiian children were somewhat heavier, and Samoan children were significantly heavier than mainland children, while the weights of Japanese, Filipino, Chinese, and Korean children matched those of mainland children. There are few differences in skinfold thickness or upper arm circumference between Hawaii and mainland school children. No evidence of over- or undernutrition was found in any groups of Hawaii school children. Hawaii school children of Asian extraction achieved greater growth in height and weight than did children of similiar racial extraction living in the Philippine Islands, Taiwan, or South Korea.

Life Plans of Low-Income Youth. Regional researchers in North Carolina and Kentucky examined the factors influencing the varying levels of educational and occupational attainment of rural youth. Low-income youth are beset frequently with problems. Unemployment rates are high and many report difficulties in finding jobs. Their job histories are spotted with work interruptions, sometimes for extended periods. Many seem to have limited resources and channels for seeking jobs or obtaining information about jobs. Such occupational problems of low-income youth assume even greater importance in a period of high inflation and high costs of housing, food and energy. The focus of the project is on the developmental aspects of the educational and occupational attainment process from childhood through young adolescence, particularly for low-income and black rural youth.

Farm Crises and the Rural Community. A University of Missouri study found that not just farmers, but also agri-business firms and other small businesses in the rural communities suffer from the current farm financial crisis. The effects of the foreclosures and bankruptcies, in turn, touch all family members, not just the operators. Farm families with children still at home predominated among the sample of farms being forced out of business. Children of these failing farms showed symptoms of anxiety, depression, decline in academic achievement and, in some cases, severe withdrawal. Adults, similarly, showed signs of mental health problems in the form of moodiness, depression, and hostility. Many families reported severe strains on marital relationships and about 10 percent have already divorced. Thus, the "farm crisis" is a more general rural community crisis, with impacts that may well continue into the next generation.

Farm Crisis Hotline. Analyses of calls to the Farm Crisis Hotline in Iowa found that in the period of January to March, 1985, about half of the callers wanted information on financial matters (e.g., how to restructure debt). About one-fourth wanted information on legal matters (e.g., how to file for bankruptcy) and the other one-fourth wanted information on how to solve personal or mental health-related problems. In late summer of 1985, however there were few calls for financial assistance, and the rest were split between legal affairs and personal problems, with severe mental health issue including the threat of suicide, predominating. Volume of calls was sustain at about 1,000 per month. This Iowa State University research indicates that the focus of the crisis is shifting from a business and financial problem to one with legal and mental health themes.

6. COMPETITION, TRADE ADJUSTMENTS, PRICE AND INCOME POLICY

Current activities: 7 percent of total Hatch funds for research. Included under this research program grouping are farm adjustments, prices and income, economic aspects of marketing and competition.

Selected examples of recent progress:

Economic Analysis of Risk Management Strategies for Agricultural Production Firms. Farmers are actively searching for management strategies which effectively reduce risk. A farm-level risk management project at North Dakota State University has focused on analysis of how effective selected current management practices can be when they are coordinated. Representative cash grain and specialty crop farms were developed to model the risk of business earnings falling below minimum target levels of return. Crop rotations, participation in government programs, purchase of all-risk crop insurance, and land rental arrangements were jointly considered. Potential for crop diversification was explicitly modeled through price and yield variability. Results indicate that farmers could efficiently attain their target returns by selectively using government programs on wheat, barley, and corn; insuring high-value crops such as sugarbeets, sunflower, and malting barley; and, negotiating crop-share lease arrangements (which share risk).

Role of Agriculture in the State Economy. Utilizing an input-output model for the State of Indiana, research was conducted by Purdue University on the role of agriculture in the state economy. Agricultural processing sectors were found to exhibit among the largest economic multipliers in the entire economy. The sale of an additional dollar of processed meat indirectly stimulates an additional $2 of economic activity in other, related sectors. Thus, gains may be made by increasing the value-added embodied in agricultural exports. Exporting additional poultry products in place of $1 million of grain would create 128 additional jobs paying $1.3 million per year.

Analysis of Interregional Water Markets. The growing demands for urban and agricultural water in California can be largely satisfied by facilitating trade in water between regions. Trade in water is currently prevented or discouraged, but minor changes in State legislation can alter this. Trade in water would supply present needs at a profit to both buyer and seller. Statewide benefits range between $70 and $150 million/year. Trade yields incentives for efficient conservation of water. The supply of water by trading and reallocation avoids the public costs and environmental controversy of large water projects. The results of the research project conducted by the University of California, Davis indicate that a limited water market is economically advantageous to all parties, physically feasible, and practical, in that large disruptive shifts in water would not take place. The research has identified and analyzed a rare situation in which all major parties, farmers, consumers, urban residents, could gain from changes advocated.

Performance of the U.S. Grain Marketing System. In recent years the U.S. grain marketing system has been in a state of transition. One area of particular importance is the grain transportation system which was effectively deregulated in 1980, after nearly 90 years of government intervention in pricing. Since then, policymakers, firms, and organizations influencing policy have been seeking answers as to whether deregulation has been desirable. One area of contention is the ability of railroad firms to exercise market power over transport rates. One part of a research project at North Dakota State University was to develop a measure of railroad market power and to evaluate the impacts of deregulation. The most important component of railroad market power was the responsiveness of competitor modes, (trucks and barges) to changes in rail rates. Results of the empirical analysis indicated that in the post-deregulation period the railroads had less market power and were more responsive to market conditions. These are desirable results of deregulation and are important to all agencies and organizations trying to influence policy.

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7. FOOD SCIENCE AND HUMAN NUTRITION

Current activities: 6 percent of total Hatch funds for research. Included under this research program grouping are human nutrition, food processing, food safety, food service, and food storage, distribution and marketing.

Selected examples of recent progress:

Membrane Processing of Proteins. University of Illinois food scientists have developed methods of vastly improving the productivity of enzymatic and microbial conversion processes using synthetic membrane technology. Traditional methods using free enzymes or cells suffer from low productivities, long reaction times, batch-to batch variations in the product and expensive post-reaction treatments. In the Illinois work, the biocatalysts are trapped or "immobilized" in membrane bioreactors that take advantage of the size differences between the biocatalyst and the product of the reaction. Phenomenal increases in productivities of fermentations have been achieved by using this membrane technology in biotechnology applications. Preliminary results from the conversion of glucose or lactose to ethanol indicate that productivities 2000-5000% better than present methods can be achieved under optimum conditions. Not only does this reduce operating cost and capital cost, but subsequent downstream processing operations are considerably reduced. Other fermentations producing higher value organic chemicals are presently being investigated.

Improved Dairy Starter Cultures. Fermented dairy products account for about 20 percent of the total economic value of the fermented foods produced throughout the world. Being able to insure the reliability of starter culture performance is of great benefit to the dairy products industry and also to retailers and consumers, since starters also govern, to some degree, the shelf life of products. Food science researchers at the University of Minnesota have pulled dairy starter culture technology into the high technology world. Research has resulted in the development of gene transfer systems to produce more reliable starter cultures. Three different systems of gene transfer in dairy starters have been developed. They have been able to take purified DNA, tailor-made to the requirements of the dairy starter culture,and add it to an appropriate cell.

Glandless Cottonseed Flour is Natural Antioxidant. Meat rancidity is a major problem for purveyors of frozen, precooked meats. Studies by food scientists at the Texas Agricultural Experiment Station have shown that glandless cottonseed flour is a natural meat preservative and could replace widely used preservatives whose safety is being questioned. The Texas researchers found that high-protein, defatted, glandless cottonseed flour is a natural antioxidant and that it inhibits lipid oxidation and discoloration in freshly ground meat. Studies also revealed the flour slowed the development of rancidity in cooked meat. The off-color and off-flavor of stored, cooked meat can be prevented, researchers found, when glandless cottonseed flour is mixed with ground meat, used in a coating mixture, or when meat is stored in a gravy containing the flour.

Soybean Process Focuses of New Markets. A large, established market for soybean curd--tofu--exists in the Far East, and the food has potential as an inexpensive source of protein for countries where protein shortages are a problem. But production of tofu has been more an art than a science, and the result was wide variation in quality. Taking some of the risks out of tofu production and improving the products are the results of food science research at Iowa State University. Researchers learned that a hot-grind processing method inactivates some of the enzymes that cause undesirable flavors in tofu. They also discovered large differences in tofu texture

depending on the soybean variety used. They tested consumer reaction to various flavored tofus. Tofu is bland and accepts flavors readily. The research dovetails nicely with an Iowa Experiment Station soybean breeding program in which large-seeded, high-yielding soybeans are being developed. Such soybeans could become important to a specialty market for tofu producers.

Market Development - Muscadine Grape Products. Market research activities conducted by Mississippi Agricultural and Forestry Experiment Station personnel continue to reveal that white muscadine grape juice has the potential of wide acceptance in both national and international markets. Researchers also produced, packaged and organized a sales test for white muscadine grape juice which continues in three eastern U.S. cities. Early results show that the movement of the product from supermarket shelves has been very encouraging. If commercial production of white grape juice, and many related products from muscadine grapes, can match the high levels of consumer acceptance found, and the comparatively high production yields found in related research, the economic impact for Mississippi and the Southeastern United States agriculture should be commensurately successful.

Role of Phenolic Compounds in Vegetables. The important class of natural products, phenolics, are known to function physiologically as insect and disease deterrents, antioxidants, cell wall components, colorants and inhibitors of soluble enzymes. A new function, the inhibition of membrane-bound enzymes has been elucidated by food scientists at the New Jersey Agricultural Experiment Station. Many commonly occurring phenolic compounds were found capable of inhibiting glucan synthase, a membrane-bound, cell wall biosynthetic enzyme. Oxidized derivatives were most potent, and inhibition was irreversible. There are several implications of these results. During chilling, enzymes important to healthy metabolism may be inactivated. The enzymes of invading pathogens may also be inhibited. This mechanism of enzyme inactivation may explain, in part, the reduction of mineral bioavailability, when phenolic-containing foods are ingested. This would occur by interaction of oxidized phenolics with intestinal brush border transport enzymes. The effects of phenolics on these enzymes are currently under investigation.

Lack of Zinc Destroys the Immune Systems in Humans. Scientists at Michigan State University have been able to demonstrate in rats and pigs that zinc deficiencies have profound effects on immune functions. Thymic atrophy, lymphacytopenica, and reduced antibody and cell-mediated responses were observed in zinc deficient mice. These experiments help to explain why zinc deficient individuals also have impaired immune functions along with numerous recurrent infections. Further work has demonstrated that short periods of suboptimal zinc nutrition can destroy the memory cells responsible for protective immunity generated by vaccinations.

Grocery Delivery Programs Help Improve Nutrient Well-Being of Rural Home-Bound Elderly. Scientists at the Vermont Agricultural Experiment Station are conducting experiments to try to help improve the nutrient quality of diets of elderly citizens. In one experiment, groceries designed to provide one meal a day for five days, with each meal containing at least one-third of the recommended daily amount of nutrients for elderly individuals were delivered weekly and supplemented with two home-delivered meals each week. Dietary records of foods consumed and blood nutrient levels of many of the participants improved after participation in the program. The scientists concluded that if such programs are adopted, many elderly could remain in their own homes and their needs could be met at much lower cost, resulting in a saving of both public and private funds.

COOPERATIVE FORESTRY RESEARCH

The Cooperative Forestry Research (McIntire-Stennis) program is planned and directed to provide answers to the complex questions that face forest land managers seeking to produce an adequate timber supply for home and other uses. Timber production and wood utilization and distribution systems are key elements of forestry research. The research also deals with the demands for wildlife production and recreational opportunity on forests. Acceptable level of environmental quality in all forest operations and uses is an important national goal to which this research is dedicated.

In addition, the McIntire-Stennis program has the objective of helping to create and maintain a highly qualified corps of forest scientists through involvement in the research projects beginning as graduate student assistants. These young men and women serve in private industry, and in various levels of government as managers and scientists as our efforts to produce more goods and services per acre of land intensifies with time.

Following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: The following research program activities encompass the range of research funded under this act:

Multi-resource inventory, appraisal and evaluation. Assessment of supply, growth and demand, new inventory methods, alternative and multiple uses, economic and social benefits.

Forest resource management. Land productivity and forest growth, reproduction of trees and stands, improved varieties, institutional regulations and forest management.

Forest protection. Systems for detecting and evaluating losses to insects and diseases; control methods; fire detection, monitoring, and control.

Harvesting, processing, marketing. Energy efficient equipment; environmental concerns; wood properties and uses; biomass for energy; rural development role of forests and forest industry.

Forest watersheds, soils, pollution. Quality, quantity water production; effects of forest management on nutrient cycling, water quality and productivity; effects of sewage disposal; air quality effects, amelioration of air and noise pollution.

Forest range, wildlife, fisheries habitat. Use and effect of grazing, forest-range management, wildlife habitat maintenance, costs and benefits.

Forest recreation and environmental values. Recreation opportunity expansion methods; demand, cost and benefit analyses; environmental quality improvement; effects on forest environment.

Selected examples of recent progress:

Sawing with Minimum Waste. Working jointly with the Department of Mechanical Engineering, researchers at the University of California Forest Products Laboratory have focused on developing thinner saws to reduce sawdust wastes during the manufacture of lumber. Work over the past decade has enabled manufacturers to use thinner saws, while at the same time avoiding the instability problems normally resulting from such thinner saws. This has

been accomplished through a basic research program which developed a clearer understanding of the stresses and heat development that occurs in saws during sawing. Companies in Sweden and Canada now manufacture equipment for sawmills that use the principles developed in the research. From an economic point of view, each 0.001 inch reduction in sawblade thickness will lead to a savings of $1,500,000 per year in California alone.

Soil Chemistry Impacts Vegetation and Wildlife. Research by the Department of Wildlife and Fisheries at Mississippi State University has shown that white-tailed deer body weights are directly associated with levels of phosphorus present in the soil. This association is closely linked with relationships between soil phosphorus levels, forage plant uptake of this nutrient, and high protein content of the browse on high phosphorus sites. A study in Michigan seeking to assess the impact of the application of non-industrial sludge with low levels of trace elements to forests arrived at strongly supportive conclusions. The implications of the results from these studies for the management of natural forage as a food source for deer and domestic livestock are significant.

Models to Predict Forest Growth. Because of the long term nature of research in forestry, scientists at the University of Illinois use computer simulation models to project the growth of forests under a variety of conditions. This has led to practical methods for approximating the precision of long term projections and the development of feedback mechanisms to automatically adjust simulation projections to local conditions. Work is currently underway that will facilitate the use of "non-research" data into models as starting conditions. Such simulation models have begun to be considered a store of knowledge about forest growth. Expert systems are being developed which will allow scientists to more precisely focus future experiments to answer questions.

Efficient Use of Wood. Researchers continue to find ways to efficiently use wood that, until recently, has been considered waste. Scientists at Virginia Polytechnic Institute and State University have been successful in modifying lignin, which makes up almost one third of the woody biomass, to make it more reactive. Currently, lignin is at best burned to recover energy, but Virginia Tech scientists have been able to produce high quality polyurethane films, foams, and polymeric substances with qualities equivalent to those made from petroleum bases. In addition, phenolic resins and adhesives may also be produced from lignin residues of pulping processes. Economic assessments of these new lignin conversion methods have demonstrated that the value of lignin may be raised to approximately $2.00 per pound as compared to $0.05 per pound when used as an energy source. More important is the opportunity to replace the major portion of the petroleum base by lignin as a chemical raw material. Over 50 million tons of lignin is produced by the pulp and paper industry each year as a byproduct of the pulping process.

A forest products chemist at the University of California has developed a process of acid hydrolysis through which wood wastes are ultimately converted to formic and acetic acid and methanol. The process appears commercially viable. A pilot plant has been built and tested and now a commercial-sized unit is scheduled for construction. The process will, if commercially successful, help utilize the Nation's large quantities of low grade hardwoods,

Energy Efficient, Economical and Biologically Sound Timber-Harvesting Practices. Scientists at the Mississippi Agricultural and Forestry Experiment Station have cooperated with forest products companies to improve the utilization of biomass in pine plantations and pine-hardwood stands in the Gulf South. Following traditional timber-harvesting operations, trees measuring five inches in dimameter, or less, and the branches and tops from harvested trees are left as residues on the logging site. This residue

constitutes from 40 to 50 percent of the pre-harvest above-ground biomass in these stands and has been uneconomial to harvest, or has had no previous economic use. Further, this residue must be disposed of prior to the establishment of the next crop of trees. New opportunities to use wood residues for fuel at forest products manufacturing facilities have prompted a re-examination of systems to harvest small material economically. As a result, biomass utilization rates have increased on an operational basis by 55 percent or the equivalent of 25 green tons per acre. The average production cost of this material, delivered to road-side sites, has been reduced to $8.30 per green ton. Additional transportation costs from road-side to manufacturing facility result in a total delivered cost for residues which is competitive with alternative fuels at the facility. Additionally, the removal of this residue during harvest has reduced the cost of establishing the next forest crop by as much as $60.00 per acre by dramatically reducing site-preparation costs prior to planting.

Plantation Management. The School of Forest Resources at the University of Georgia and 14 forest-based industries have developed a Plantation Management Research Cooperative that has, in its first ten years, achieved substantial research progress. The systems developed by the Cooperative facilitate the accurate modeling of the growth and yield of several of the species-environment combinations important in the Southeast. Based on these models, computer algorithms have been developed that will project the volume of timber by product class with inputs of only the current age of the stand, the site index, and a measure of density. These product class projections have been used extensively by industrial forest managers to determine the optimum rotation age, to select the optimum planting density, and to prepare harvest schedules. The project has demonstrated that industrial forest firms and the Land-Grant colleges can indeed be partners in progress.

1890 COLLEGES AND TUSKEGEE UNIVERSITY

The Evans-Allen formula funded research program for the 1890 Colleges and Tuskegee University was established in the Food and Agriculture Act of 1977, as amended. Section 1445 of P.L. 95-113 authorized annual appropriations to support continuing agricultural research at the 1890 Colleges and Tuskegee University and funds were appropriated beginning in fiscal year 1979.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: The annual research program at the 1890 Colleges and Tuskegee University places emphasis in the areas of human nutrition, rural development and quality of living, limited resource farming, crop resources and animal resources. The research projects currently being conducted in the 1890 Colleges and Tuskegee University are distributed into several research programs as follows: natural resources, 11 percent; crop resources, 27 percent; animal resources, 26 percent; people, communities, and institutions including rural development, 17 percent; competition, trade adjustments, price and income policy, 4 percent; and food science and human nutrition, 14 percent.

Human Nutrition. Human nutrition research provides fundamental knowledge about the relationship of food eaten by people to their physical and mental status and development and the levels of well-being maintained during the life span. Research has also been conducted on human requirements for nutrients.

Rural Development and Quality of Living. Research on income improvement in rural communities will identify ways by which depressed areas can attain full economic potential. Only by providing adequate income opportunities can these communities retain more of their young people and finance the kind of public and private facilities and service that make them attractive places to live.

Limited Resource Farming. Research on farm systems for small operators must be totally integrated into a comprehensive plan responsive to total needs of a particular farm enterprise system coupling production, utilization, and marketing of the farm commodity. In order to increase agricultural incomes for small farm units, a total comprehensive research plan must be developed - one that considers all aspects of cost and management efficiencies in production, utilization, and marketing and then integrates these separate factors into a comprehensive program package.

Crop Resources. Breeding, selection, and utilization of crops is a major concern of scientists. This includes development of drought, insect and disease resistant cultivars. Effort on evaluation of crops to be grown on soils not suitable for commonly grown crops because of pathogens, nematodes and insects will be undertaken. Studies will be conducted on the mechanisms of both natural and artificial regulators that are known to influence plant growth and development.

Animal Resources. Studies are being conducted on diseases, parasites and other health hazards that are major causes of reduced productivity in food animals. Research objectives are aimed at the development of technology for prevention, treatment and control of these problems. Research of sufficient concentration is being mounted to elucidate the cellular mechanisms that govern protein and fat synthesis in farm animals. Investigations on such factors as genetics, nutrition and endocrinological factors provide needed information on biomechanisms.

Selected examples of recent progress:

Pathogenicity and Epidemiology of Soybeans. The major economic pests and diseases of soybeans in Alabama are soybean cyst nematode (SCN), phytophthora root rot (Pmg), soybean stem canker (Dpc), and bacterial blight. Research scientists at Alabama A&M University have identified two races of Pmg and two races of SCN in North Alabama. In cooperation with soybean breeders, these races of Pmg and SCN were used in screening improved soybean lines germplasm for resistance to the pathogens. Seventy improved soybean lines with multiple resistance to SCN, Pmg, Dpc, and bacterial blight have been tentatively identified. Further screening will be conducted, not only for multiple disease resistance, but also for excellent agronomic characters. These soybean varieties with multiple resistance to diseases as well as excellent agronomic characters will be released to farmers in order to expand soybean production, with negligible yield loss due to diseases.

Agricultural Food Chain. Trace amounts of toxic substances are entering the agricultural food chain as a result of industrial and agricultural activities that have adulterated soil and irrigation water used for agricultural production. Accordingly, several studies were conducted at Prairie View A&M University, (Texas) College of Agriculture to monitor metal retention and movement, specifically lead (Pb), cadmium (Cd), and nickel (Ni), within pathways of an agricultural food chain beginning with relatively low-level contamination of soil comparable to those surveyed peripheral to large cities. The soils were sown to grain/hay (wheat, milo, sorghum hay) and the metals traced via the farm produce into ruminant animals (goats), poultry (laying and broiler chickens), into animal products (milk, eggs and meat) and, finally, into the fetal tissues of pregnant goats. It was found that the

ingestion of the grain did not induce significant retention of Pb or Cd in poultry muscle or liver, and only small amounts were detected in egg albumin. Mature goats ingesting hay for 109 days did not exhibit significant retention of Pb in the liver, kidney, colostrum and bone marrow, and only slight, but significant elevations of Pb in blood and select brain tissue (cortex and cerebellum). Nickel retention was non-significant in goat livers. However, ingestion of hay by pregnant goats resulted in transfer of Pb into fetal blood and liver, but was not detectable in whole fetal brain. (Cd and Ni concentrations in these tissues have yet to be determined). It became apparent that only minuscule quantities of the relatively large, labile pool of soil Pb, Cd and Ni were taken up and retained in plant tissues. In these experiments, the quantities of toxic metals derived from a labile soil source were reduced along each pathway of the food chain as barriers and biological sinks were encountered. It is reasonable to postulate that even a relatively low-level contamination of soil would induce significant responses in crops over many cropping seasons, but would not result in significant elevations of the metals in animal tissues used as human food.

Breeding Sweet Potatoes. In America, sweet potato acreage and sweet potato growers' income dropped markedly in recent decades. High production costs contributed much to this fate but this contribution can be lessened. An effective and stable way to do that is to genetically develop sweet potatoes that tolerate minimum cultural conditions. Such a project has been in progress for several years at the University of Arkansas at Pine Bluff. In the project, researchers selected sweet potato genotypes having desirable root appearance, yield, and eating quality. Selections were made from among sweet potatoes treated with reduced cultivation,low soil fertility, pruning, waterlogged or droughty soil, or one or more diseases, insects, or weeds. Genotypes meritorious in yield and quality when subjected to stresses were identified. The traits permitting plants to respond in this way were studied in 1984, focusing on traits that are now contained in several genotypes, and that might be bred into one genotype. Such a genotype will allow growers to do significantly fewer cultural practices, without sacrificing sweet potato yield and quality.

Selenium Supplementation Increases Reproductive Efficiency of Female Livestock. Animal scientists at North Carolina A&T State University have demonstrated that the supplementation of the trace mineral selenium (Se) in commercial dairy herds in the selenium-deficient areas of North Carolina significantly decreased the incidence of retained placenta following calving. Also, in ewes fed low selenium diets, the injection of selenium prior to mating increased fertilization rate. Studies in beef bulls, rams and boars indicated that the number and viability of sperm were not affected by a low selenium status, suggesting that there may be no ill effects on the reproductive capacity of male livestock consuming feeds low in selenium. The University, as a service, will determine th selenium level in blood samples obtained from female livestock in the state.

Antimicrobial Activity Produced by Streptococcus thermophilus. Studies by food scientists at Alabama A&M University using an inhibitory substance produced by a strain of Streptococcus thermophilus, have demonstrated that the growth activities of certain mycotoxigenic species of molds may be altered. Findings indicate that the extent of growth inhibition (mold) by the antibiotic-like substance produced by S. thermophilus is a function of time and concentration of the inhibitor. The implication of these observations is that if this substance can interfere with cell replication and growth it might have some effect on mycotoxin production. Conclusive evidence that shows the antagonistic nature of the inhibitor produced by S. thermophilus against a large variety of spoilage and pathogenic bacteria has also been gathered. This work has demonstrated that the meat flora of intact beefsteak can be reduced by using the inhibitory substance; hence, an extended shelf life is realized.

Anemia in Adolescents. Low dietary intake and low blood levels of folic acid are frequently reported for adolescents. However, the significance of these findings are not known. To obtain more information about folate status of adolescents, a supplementation study was undertaken by Lincoln University (Missouri) researchers. Twenty-four adolescents (ages 11-14) received 400 ug of folic acid daily for 60 days while 12 were not supplemented and serve as controls. After supplementation, increases in serum and red blood cell folate levels indicated that folic acid was absorbed and stored. The supplemented group showed a significant mean increase in hemoglobin concentration of 0.4 g/dl. A hemoglobin increase 1.0 g/dl or more was observed in five subjects, and four had an intermediate response of 0.5 to 0.0 g/dl hemoglobin values. For the 36 adolescents sampled, only 2 females had less than 11.5 g/dl of hemoglobin (used as the standard criteria of anemia). It appears that folate deficiency anemia cannot be defined on the basis of low hemoglobin concentration, and that increases in hemoglobin in response to folic acid supplementation may be useful in its identification. Additional observations concerning folate status were made on 128 boys and 170 girls in three junior high schools. Grade point averages (GPA) were compared to serum and red cell folate levels Significant correlations were found, in both boys and girls, between GPA scores and blood folate values. No other consistent relationships were observed between either intakes, or blood levels, of other nutrients and GPA scores.

Effects of Soil Borne Organisms Upon Soybeans. A biological control program initiated by scientists at South Carolina State College has resulted in limited control of the charcoal rot fungus (Macrophomina phaseolina) by the antagonistic fungus (Trichoderma harzianum) in greenhouse-grown soybean plants. Biological control of plant pathogens offers an alternative to pesticide use. This could be a step toward a possible solution of our water pollution problem, and improved health of people worldwide.

Behavioral-Nuritional Weight Loss Program. Shopping with a list and shopping after a meal are two commonly employed behavioral weight loss guidelines designed to reduce food purchases and, therefore, food consumption. A Lincoln University (Missouri) survey of 596 shoppers, which analyzed purchases on the basis of caloric value, failed to support either of these guidelines. Analysis of kilocalories (kcal) purchased indicated that overweight shoppers purchased more total kcal, with a higher percentage of their kcal coming from fat, with a corresponding reduction in the percentage of kcal coming from carbohydrates. These results indicate that it is inappropriate for home economists to continue to recommend shopping "with a list" and "after a meal" as techniques to reduce food purchasing without also giving detailed instructions on how to actually implement these techniques. The results also suggest that dietary recommendations calling for reduced fat consumption may have greater impact on the food purchases of overweight individuals than on their normal-weight counterparts.

Seasonal Variation in Blood Counts. Scientists at Kentucky State University measured erythrocyte and leukocyte counts and hematocrit and hemoglobin values in summer and winter from samples taken from 130 adult females between the ages of 51 and 86. They were able to obtain statistically significant differences between summer and winter values for the above measurements. As a result of this research, they suggest that seasonal variations should be taken into consideration while evaluating such survey data.

Appraisal of Soybean Germplasm. An investigation was carried out by scientists at North Carolina A&T State University to evaluate soybean germplasm tolerance to manganese deficiency toxicity, and to determine the effect of various rates of manganese application and soil pH levels on

manganese accumulation by the germplasm lines and their yields. A number of germplasm lines were tested using a split plot design. There was an increase in bean yield by all germplasm lines due to manganese application. Highest rate of manganese gave the highest yield. Results indicate significant differences in bean yield among the various germplasm lines. There was an increase in managanese concentration in the beans as the rate of manganese addition increased, and it was reflected in higher yield. Soybean germplasm yields were greater at pH 6.3. Accumulation of manganese was less at pH 7.0 and greater at pH 5.3 which in turn resulted in poor plant growth and bean yield. In general, strongly acid conditions of the soils at pH 5.3 resulted in manganese toxicity to the germplasm lines. However, some of the germplasm lines survived the strongly acid conditions and gave reasonable yields. The significance of this study is considerable by identifying the soybean germplasm lines that are tolerant to deficiency and toxicity of manganese and soil pH. This will aid in increasing the supply of soybean seed suitable to grow under varying soil and management conditions. From a financial point of view, the contribution of this investigation is considerable, given the necessity for a safe soybean seed supply for the growers at large.

Hybrid Soybeans Evaluation. The magnitude of heterosis for yield and yield components for soybeans grown in replicated row trials was studied, and the performance of advanced generation soybean hybrids was evaluated by Tennessee State University scientists. Averaged over several years, mid-parent heterosis ranged from -21 percent to 42 percent, and high parent heterosis ranged from -27 percent to 35 percent. In the first generation, F-1, hybrid study the following conculsions were drawn: F-1 hybrids outyielded the parental cultivars in replicated row trials; the preceding held true in stressed low yield environments; increase in yield attributed to more pods and seeds per plant and larger seed size in F-1 hybrids; hybrids were taller, which could account for the increase in number of pods per plant; amount of heterosis in F-1 hybrids in replicated row trials was of the same magnitude as has been reported from space plant data; and, heterosis (as expressed in certain crosses) is of sufficient magnitude to justify further research efforts to produce F-1 hybrid seeds on a large scale. Succeeding generation (F-2, F-3, F-4, and F-5) hybrids were compared with each other, and with their original parental cultivars. Although the yields varied greatly depending on the cross, generation, and year, the yields of some of the advanced generation hybrids were as high, or higher, than the best parental cultivars. The higher yields of certain crosses seemed to be consistent over the years. These results may be of significance in two ways: specific high-yielding advanced generation hybrids could be grown directly by the producer; and, there is the possibility of higher yielding lines being selected from the better advanced generation hybrids.

Adaptability of Sweet Corn Hybrids. Research was done at the Southern University (Louisiana) during the 1983 and 1984 growing seasons to obtain an unbiased comparison of sweet corns for their yield and agronomic performance. Results indicated that significant differences existed in all performance measurements in 1983 and 1984 tests. The mean number of days to maturity of hybrids in both performance tests ranged rom 74 to 92 days. The average yields from the tests ranged from 2,719 to 1,148 marketable ears in dozens per hectare. Top yielders showed sufficient promise for their adaptability under South Louisiana soil and climatic conditions. Results indicated that some of the intermediate and lower yielding hybrids had good ear quality when compared to certain of the higher yielding hybrids.

The Future of Small Farms in North Carolina. Research at North Carolina A&T State University indicates that the number of small farms in the State will continue to decline over the next five years. Various socio-economic and farm operation characteristics will have an impact on this decline. From regression and Pearson correlation analysis of these characteristics, it was determined that the number of small farms has declined by an average of 15 percent until 1984, and will continue to decline at a lesser rate for the rest of the decade. Also, it was determined that low income and poverty will continue to be a problem for small farm families. The poverty rate among small farmers (30.5% in 1979) is disproportionately high when compared to other sectors of the economy in North Carolina and the U.S. Furthermore, rural areas in general will deteriorate as business and tax base decline as a result of small farmers going out of business. There will also be a loss of land to non-agricultural purposes as a result of a decline in the number of small farms. Assistance from research and extension programs, directed specifically to the needs of small farmers, may be through increasing production, finding off-farm employment, or transfer payments. There is no one type of assistance which is best for all small farmers. This should be determined by each individual farmer's particular needs.

Domestic Production of Herbs and Essential Oil Plants as High-Cash Crops. Research at Delaware State College is focused on utilizing limited resource farmers in production of herbs and essential oil plants for a two-fold purpose: reducing U.S. dependence on imported products and providing a secondary source of income for the small farmer. Rapidly changing global politics make it desirable to turn to domestic sources of certain agricultural commodities. In addition, these crops can provide a gross of $500 to $15,000/acre (compared with corn and soybeans at $200/acre at 1979 national averages). Preliminary management techniques have been documented for lavandin (imported from France), oregano (harvested from wild in Greece and Turkey), damask rose (imported from Bulgaria), clary sage (imported from USSR., central Europe, Morocco), Dalmatian sage (harvested from wild in Yugoslavia and Albania), savory (imported from France and Spain), tarragon (imported from France), and saffron (imported from Spain and Portugal, at skyrocketing prices). Selections of these plants have been acquired and are being implemented into production for buyers from the fragrance and flavor industries.

GRANTS TO UPGRADE 1890 LAND-GRANT COLLEGE RESEARCH FACILITIES

The National Agricultural Research, Extension, and Teaching Policy Act Amendments of 1981, Section 1433, Public Law 97-98, authorizes funds for the 1890 Institutions and Tuskegee University, for the acquisition and improvement research facilities and equipment. These funds are available for grants to the eligible institutions for the purpose of assisting them in the purchase of equipment and land, and the planning, construction, alteration or renovation of buildings to strengthen their capacity to conduct research in the food and agricultural sciences. Four percent of the sums appropriated shall be available to the Secretary for administration of the grant program.

It was the intent of Congress that this program be carried out over a five-year period at an authorized level of $10 million per year or a total of $50 million.

Section 1445 of Public Law 95-113 authorized continued Federal funding of the agricultural research programs carried out by the 16 Land-Grant Colleges of 1890 and Tuskegee University. Existing facilities utilized for research at these institutions need to be renovated and improved to provide the conditions necessary

to conduct top quality research. In addition, new facilities need to be constructed since either the existing ones are not adequate for the conduct of highly complex research or the existing facilities do not contain adequate space for the current staff and space needs for their projected research programs.

The following is a description of current activities relative to the appropriated funds:

Current activities: CSRS has approved for each 1890 Institution and Tuskegee University a Five-Year Action Plan for the Development of Research Facilities. This approval means general acceptance of the overall action plan for the development of research facilities as authorized by Section 1433, P.L. 97-98. Further, individual research facilities grants for FY 1985 have been awarded to the seventeen institutions. These grants approve expenditure of FY 1985 funds authorized under Section 1433 for specific construction, renovation projects, or the purchase of land and equipment.

Selected examples of recent progress:

Georgia. Fort Valley State College, Fort Valley, Georgia has completed the construction of the Dairy Goat Research Complex. The dairy goat complex consists of eight small buildings including a milking parlour, photo-period building, feed processing structure, kid and yearling barn and a buck building. Major research equipment has been installed in these facilities.

Florida. The construction of a research equipment storage building at Florida A&M University was completed during the year. Also, major renovation of the animal science pasture area has been accomplished. This involved installation of fencing and watering systems.

Oklahoma. Langston University has under construction major renovation and erection of facilities to house the American Institute for Goat Research. The construction includes a maternity unit and a state of the art feed mixing operation structure and security fencing. The Institute will focus on both meat and dairy goat research. The electronically assisted milking parlour will be a first (prototype) for the dairy goat industry.

SPECIAL RESEARCH GRANTS

The Special Research Grants program concentrates on problems of national interest beyond the normal emphasis in the formula program.

Following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: In fiscal year 1986 under the Special Research Grant program, grants will be made to the four regional leader laboratories and the headquarters laboratory to continue the pesticide clearance and minor use animal drugs research program (New York, Michigan, Florida, California and New Jersey) and to continue the on-going pesticide impact assessment program. Each of the agricultural experiment stations in Idaho, Oregon and Washington will receive a grant to continue the research on soil erosion supported under this authorization. A grant involving 16 states also will be made to continue the food systems research program. Grants will also be made in the areas of guayule research, germplasm resources, integrated pest management, and tropical and subtropical research.

Included under the Special Research Grants program are Native Latex grants authorized by Public Law 98-284 and rangeland research grants authorized by

Subtitle M of Public Law 97-98. In fiscal year 1986 Special Research Grants will be awarded competitively, utilizing peer panels of scientists to evaluate the scientific merit of proposals in the areas of animal health and aquaculture research. Animal health research will be limited to specific, high priority problems as recommended by the Animal Health Science Research Advisory Board. Solicitation of applications for fiscal year 1986 grants to be awarded competitively will be published in the Federal Register. It is anticipated that grants will be awarded by August 1986.

In fiscal year 1985, 61 Special Research Grants were awarded competitively. Given below are details on the number of proposals submitted and the number of grants for each area.

Specific Area Of Inquiry	Number of Proposals Submitted	Annual Request	Number of Grants Awarded	Amount of Awards
P.L. 89-106:				
Animal Health	433	$52,790,835	54	$5,761,800
Aquaculture	77	5,495,102	7	497,435
P.L. 97-98:				
Rangeland	67	5,147,151	7	480,150

Selected examples of recent progress:

New Test and Vaccine for Vesicular Stomatitis in Cattle. Using biotechnology research techniques, Washington scientists have developed a new diagnostic test, and a vaccine for vesicular stomatitis which is superior to previous biologics used in controlling this disease. Vesicular stomatitis is a highly contagious viral disease of livestock which causes lowered milk production, weight loss and death in cattle. This disease is of great concern to livestock disease control officials since its symptoms and rapid spread are often identical to foot-and-mouth disease. Time-consuming tests have been required to be certain that vesicular stomatitis outbreaks are not foot-and-mouth disease. The new vaccine provides an immunity of much longer duration than previous vaccines, and permits differentiation of vaccinated animals from those naturally infected. The new diagnostic test permits identification of vesicular stomatitis outbreaks under field conditions in less than six hours. This will be of great assistance to livestock disease regulatory officials in assuring almost immediate differentiation of vesicular stomatitis from foot-and-mouth disease.

Progress in the Search for a Vaccine for Anaplasmosis. Washington scientists, using biotechnology procedures, have identified and isolated a membrane protein from the causative agent of anaplasmosis that induces an immune response in cattle. They have found that the protein is present in all isolates of the disease agent tested, thus far, in the United States. This suggests that a subunit vaccine developed from this protein has promise of controlling the disease throughout the country. Their research now is centered on constructing the vaccine by genetic engineering techniques. Anaplasmosis causes the death of over 100,000 cattle a year in this country at an annual loss estimated to exceed $100 million. There is urgent need for more effective methods to control the disease. Advances in biotechnology research, such as are being made in this study, offer excellent prospects for improved prevention and control.

Prevention of Bovine Respiratory Disease. Respiratory disease in cattle causes annual losses exceeding $500 million, making this the disease problem of greatest concern in the production of beef. Although numerous agents may be involved in causing the disease, the bacterium Pasteurella haemolytica is one of the agents most frequently associated with the disease. Oklahoma scientists have found evidence that P. haemolytica produces respiratory disease by means of a toxin, and that resistant animals have protective antibodies against the toxin in their blood stream. Following these clues, the Oklahoma scientists have produced a vaccine that produces toxin-neutralizing antibodies in calves. The resulting level of resistance to respiratory disease is directly correlated with the amount of toxin-neutralizing antibodies produced by the vaccine. These findings help clarify the mechanism by which bovine respiratory disease occurs, and provide the basis for the eventual production of more effective vaccines.

Mechanism Determined of Edwardsiella ictaluri Disease in Catfish. Infection with Edwardsiella ictaluri is now the number one cause of bacterial disease in catfish aquaculture and results in annual losses estimated at over $3 million. Georgia scientists have successfully determined how the disease is produced and, thus, have enhanced the ability to control this disease. They have found that the disease may take two different forms. One is an acute disease with intestinal symptoms and heavy mortality. In the second form the bacteria cause a chronic infection of the nasal lining which may extend into the brain and cause death of the fish. The development of methods to recognize and study both forms of the disease is an essential step in determining how to treat and control this important disease of cultured catfish.

Foundation Laid for the Mapping of Cattle Genes. Although, through selection, the cow has long been a target of genetic manipulation, very few discrete genes have been identified and practically none have been mapped. Using panels of cow-hamster hybrid somatic cells and enzyme electrophoresis, researchers at Texas A&M University have mapped 35 cattle genes to 23 syntenic groups. A remarkable homology with the human gene map has been noted and only three discordancies in linkage conservation have been discovered among these 35 loci. This work lays the foundation for cattle gene mapping and suggests that homology with the human map is sufficient to predict the location of cattle genes by the map position of the human homologue.

Soil Erosion - Productivity Relationships. The losses of soil and water runoff from farmland in the Pacific Northwest are extremely serious as they affect future productivity of the land. A coordinated 3-State, multi-disciplinary research program titled STEEP (Solutions to Environmental and Economic Problems) is designed to obtain answers to soil, water, and crop management problems. The Idaho Agricultural Experiment Station estimated annual cost of losing 10.4 tons per acre of topsoil from Naff and Palouse soils, in the Idaho Palouse at about $12 and $16 per acre per year, respectively. This was based on data of soil fertility, soil moisture, soil physical properties, winter wheat yield, and plant vigor on 116 sites of Naff and Palouse soils. Data from eastern Whitman County, Washington, indicated winter wheat yields were adversely affected by reduction in topsoil depth. Statistical comparison of data from winter wheat yields and topsoil depths in the eastern Palouse region confirmed that technology progress had increased yields by about 60 percent more on deep versus eroded topsoils. Estimates based on a soil productivity index (PI) and a group of soil series descriptions for Pacific Northwest sites predicted yields of about 6,000 pounds per acre of winter wheat for deep (48 inches over bedrock) soils and about 3,100 pounds per acre for soils with less than 24 inches depth over bedrock. The PI predicted at least a 20 percent loss of productivity from 50 years of erosion. Analysis of data from a regional resources inventory indicated about 45 percent of the tilled land in the Columbia Plateau of northeastern Oregon has soil depth less than 48 inches. Such data are useful for assessing impacts of erosion.

Velvetleaf Control. Velvetleaf has been a troublesome weed in soybeans in the Midwest for many years. Recently it has become a serious pest in New York and New England due to resistance to herbicides. At the University of Vermont, researchers discovered a fungus blight of velvetleaf identified as Colletotrichum coccodes. The fungus was tested to determine the weed and crop host range and potential as a biological control agent. In field trials, velvetleaf injury due to the fungus ranged from a severe reduction in growth to death of the plant. Biomass was reduced by an average of 75% over untreated controls and in plots where a soybean crop added competitive stress, velvetleaf did not survive. Commercial application of the fungus awaits further research as to how the pathogen must be produced and formulated on a large-scale basis.

Tropical/Subtropical Research. Winged bean is a popular vegetable in some parts of the tropics. Studies at the Guam Agricultural Experiment Station have shown that winged bean production can be increased by using the cultivar "chimbu", which produces pods for six months instead of the usual one month. Seeds of "chimbu" are now being distributed to growers as a result of this study.

The noxious weed, Chromolaena odorata, invades Guam rangelands and plantation agriculture by disseminating massive quantities of seed which germinate and slowly poison neighboring plants with toxic exudants. The insect Pareuchaetes pseudoinsulata was imported from Trinidad, West Indies to control the weed. Mass rearing techniques have been developed and the equivalent of 75,000 eggs are being released each month. Once established, evaluations of the insects' impact on the weed can be followed. The difference in vegetative growth between Guam and New World tropics has been investigated and the major differences between the weed's growth in native lands and Guam is in stem elongation. Arrangements to import insects that destroy stem tips also are in progress.

Rural Development Centers. A study sponsored by the Northeast Regional Center for Rural Development at Cornell University found that health policies developed for urban settings do not fit in rural areas. For example, contrary to the expected model, elderly married women in rural areas reported the highest levels of ill health related to stress even though the family was seen as an important factor in helping the elderly to cope with stress. The researchers are conducting a follow-up study to further explore these findings.

Concern over the potential negative impacts of rapid energy development in the West prompted the Western Rural Development Center at Oregon State University to study the relationship between satisfaction with land use policies and the need for economic development. In Colorado, it was found that people were more dissatisfied with current land use policies than with other public services, but there was disagreement regarding the effects of land use policy on economic development. When asked about the effects of current land use planning, 43 percent of the sample believed land use policy discouraged economic development, while 33 percent felt it aided development. Urban residents were more likely to believe that land use policy aided development. Thus, land use policy is being vilified by both economic development proponents and those more concerned with environmental quality.

Integrated Pest Management. The Consortium for Integrated Pest Management (CIPM) comprising 17 land-grant universities has for the last five years been aggressively conducting interdisciplinary research focused on crop development and crop-pest interactions. The accomplishments and improvements in productivity in the alfalfa, apple, cotton and soybean production systems were summarized in a National Symposium held in the National Academy of Sciences on October 8-10, 1985. Proceedings will be published in 1986.

A well-founded National Integrated Pest Management Program based on four regional and interregional efforts has been developed and outlined in a national plan for Integrated Pest Management: Research, Education and Technology Transfer. The National IPM program has identified interdisciplinary priority research needs from the diverse production and protection demands that are unique to the four USDA regions. The commodities that are receiving priority attention are: alfalfa, potatoes, range, small grains, tree fruits, corn, confined livestock (beef), dairy forage, cotton, and soybeans. An analysis has been made in each of the commodity areas relative to research areas, pests and pest complexes requiring priority consideration. An example is the analysis of potato production systems in the North Central region. Crop, pests, predator/parasites, production practices, farmer decision practices and control measure variables have been analyzed to identify knowledge gaps and research priorities. Decision alternatives relative to producing a potato crop were characterized and enterprise budgets developed to represent the seed, table, and chipping potato production systems. Crop protection costs were 10-15% of total costs in most production systems, however, when considered in conjunction with pay off matrices, pest protection assumed additional importance as protecting the overall investment. The research priority analyses for potatoes in three regions provided the basis for soliciting research proposals in the identified priority areas, conducting peer evaluations and funding outstanding proposals. Another example is the analysis of the wheat production system. Barley yellow dwarf virus and vectors in the wheat production system were shown to cause 5 to 20 percent losses in wheat nationally with over 50 percent losses in some fields in the Northwest. Interdisciplinary research on barley yellow dwarf vector biology and vector migration, the characterization of barley yellow dwarf virus strains, and vector-strain relationships have been identified as priority research to reduce a major limiting factor to improved wheat productivity. Research proposals are being funded that use new biotechnological techniques that demonstrate outstanding promise to identify virus strains, substrains and vector and subvector efficiency.

COMPETITIVE RESEARCH GRANTS

The Competitive Research Grants program was initiated by the Department in 1978 to fund basic research in selected high priority areas related to plant production and human nutrition. Basic research initiatives implemented in 1985 encompassed broader research perspectives pertinent to the national interest in plant and animal science and biotechnology. The competitive grants complement the on-going research efforts of the USDA and the traditional agricultural research arena by the participation of research scientists throughout the entire U.S. scientific community who have outstanding expertise in these related areas.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: Fourteen targeted areas were identified as possessing great opportunities for scientific discoveries and for contributing to research vitally needed to solve important food problems. There are four target areas in plant science relating to crop productivity: photosynthesis, nitrogen fixation, genetic mechanisms for crop improvement, and plant protection from biological stress (e.g., insects, microbes, viruses, and nematodes). The target areas in human nutrition address establishment and bioavailability of human nutrient requirements. Soybean research, acid precipitation, alcohol fuels, pest science (gypsy moth, boll weevil/bollworm, and pine bark beetle)and animal science (reproductive efficiency and physiology, and brucellosis) were specific targeted research categories begun in 1985. The 1985 biotechnology initiative targeted compelling agricultural research needs in these areas: Structure, function and organization of plant, animal, microbial genomes; transfer, expression, and regulation of individual genes and gene systems; and genetic and molecular control of growth, development, and resistance to physical and biological stress.

The Competitive Research Grants Office received research proposals in FY 1985 requesting about $493 million for support of research in the targeted areas. From those proposals 449 grants were made. Only a small portion of the dollars requested for research proposals that were rated superior by the peer panels and ad hoc reviewers were funded. Table 7 provides details on the number of proposals submitted, the numbers of grants awarded and the major categories of grants organization.

Selected examples of recent progress:

PLANT SCIENCES AND HUMAN NUTRITION

An Alternate Nitrogen Fixing System. Reduction of atmospheric nitrogen, which is catalyzed by the enzyme nitrogenase, has been shown to require molybdenum. A biochemist at North Carolina State University has recently found an alternate nitrogen fixing system in a mutant of the bacterium, Azotobacter vinelandii. This system is expressed under conditions of molybdenum deficiency. The scientist has found that a mutant, with genes for the structural proteins of nitrogenase deleted, retains the ability to produce ammonia. Evidence in the literature of a second copy of a structural gene for nitrogenase in another organism contributes to the plausibility of such a system. The long term implications of this discovery of an alternate nitrogen fixing system remain to be seen.

Ammonium Transport System in an Actinomycete (Member of an Order of Filamentous or Rod-Shaped Bacteria). Some members of the genus Frankia, an actinomycete, form nitrogen-fixing symbioses with nonlegumes. Research on Frankia is related to forest productivity and land reclamation, since many of the host plants of these symbioses are very fast growing and are therefore useful for reforestation. Frankia has been obtained in pure culture only in the last four years; hence, research in this area is in a very early stage. Scientists at the University of Connecticut have isolated many strains of this organism and categorized them on the basis of the carbon source on which they would grow, an indication of genetic diversity. They have now found an active ammonium transport system in one strain of Frankia. This is believed to be the first demonstration of an ammonium transport system in an actinomycete and is a major step in the study of the nitrogen metabolism of this particular genus.

Discovery of a Natural Genetic Transformation System in a Denitrifying Bacterium. Denitrifying bacteria convert nitrates to gaseous nitrogen compounds, such as N_2, representing a loss of fixed nitrogen in the soil. One of these organisms is Pseudomonas stutzeri. At the University of California, Davis, the approach of physiological genetics is being used in this bacterium to study the biochemistry and regulation of the process of denitrification. A major breakthrough on this project has been the discovery of a highly efficient natural genetic transformation system. On contact, cells released DNA that was taken up by other cells. This appeared to be an active process since it was dependent on DNA synthesis by the donor cell. Genetic manipulations are now being used to study the individual steps in the pathway of denitrification.

Regulation of Excitation Energy Transfer Among Pigment Systems Involved in Photosynthesis. Transfer of energy among pigment systems after light is absorbed by higher plants, algae and cyanobacteria, is essential for the final production of reductant for carbon metabolism and for oxygen evolution. An investigator at Brown University has been studying the

regulation of excitation energy transfer in the photosynthesis of organisms that rely on phycobilins as accessory light harvesting pigments. Through studies of the kinetics of the light state transition and the decay kinetics of fluorescence emission, he has demonstrated the sequential transfer of excitation between these pigments and chlorophyll a, one of the two central pigments involved in the two photosystems of photosynthesis. He finds that the energy state transition in these organisms is radically different than that observed in higher plants. From results obtained, a model has been proposed for the regulation of excitation energy transfer.

Studies on Electron Transport in Anabaena Heterocysts. Anabaena is a cyanobacterium which grows as a chain of single cells. The majority of these cells are vegetative and contain a complete photosynthetic apparatus - both Photosystems I and II. Some of the cells, however, differentiate into heterocysts which contain only Photosystem I and lose their capacity to evolve oxygen. At Brookhaven National Laboratory, heterocysts are being used as a model system for the study of electron transport in Photosystem I. In the process of investigating membrane-bound electron carriers, scientists demonstrated for the first time the existence of cytochrome a_3 in membranes of these cells. It was present at 4 to 100 times higher concentrations than in the vegetative cells. Thus, heterocysts would be an excellent source for isolation and purification of this component of electron transport in cyanobacteria. They also found that heterocyst membranes lacked one of the cytochromes ($b\text{-}559_{HP}$), primarily associated with Photosystem II, but contained cytochrome $b\text{-}559_{LP}$. The function of the latter cytochrome has not yet been determined. Comparisons are being made with higher plant electron transport systems.

Identification of Polypeptides Associated with Photosystem II of the Photosynthetic Apparatus. An investigator at Oregon State University is examining the primary mechanisms of early reactions of Photosystem II, namely water photolysis and oxygen evolution. He has developed a variety of mutants of the unicellular green alga, Scenedesmus obliquis, with lesions in this photosystem. Biochemical-genetic analyses showed that two major chloroplast membrane polypeptides are essential for activity. These were later demonstrated to be apoproteins of the Photosystem II reaction center and a light-harvesting (antennae) chlorophyll - lipoprotein. Together they are the pigment-lipoprotein core of the system. The scientist discovered that six other chloroplast membrane polypeptides are associated with the actual water photolysis/oxygen evolution system. Among these is one polypeptide which has been confirmed to be the manganese - binding protein of the chloroplast. Manganese is a requirement for photosynthetic oxygen evolution. This extensive mutant collection has also been made available to other research scientists in this field.

Biosynthesis of Insect Hydrocarbons -- Potential for Insect Control. Information is needed on functions of certain metabolic processes in insects to provide the focal point for studies leading to the logical discovery of selective agents for insect control. An investigator at the University of Nevada has explored the timing of compounds that produce the insect cuticle, and transport of these compounds to the insect surface in relation to development in the cabbage looper. The results from this investigation should allow scientists to devise methods of disrupting the thin layer of cuticular lipid that serves to prevent the desiccation and death of insects. Insects account for tremendous losses in food and fiber and the continued development of effective and environmentally compatible control techniques is necessary.

Identification of Host Components Determining Resistance or Susceptibility to Toxins from Fungal Pathogens. Plant disease is characterized by highly specific interactions between individual strains of fungal pathogens and only certain cultivars of their hosts. The structures of three fungal host specific toxins that cause serious diseases in corn have been described by an investigator at the University of Nebraska. Based on this information, the investigator has now proposed to identify the host constituents with which the toxins specifically interact in the corn plant. These host-specific toxins thus provide an important probe for understanding the nature of disease resistance and susceptibility in economically important crops.

The Use of Cauliflower Mosaic Virus Genome for the Introduction of Foreign DNA into Plants. The cauliflower mosaic virus (CMV) is a DNA virus containing a circular double-stranded DNA molecule. Upon infection, the CMV multiplies quickly and is spread throughout the entire plant, but the virus is not lethal to many of the infected plants. Plant molecular biologists saw these characteristics as potential gene vectors for genetic engineering of higher plants. The concept is that a foreign gene inserted into the CMV-DNA would be carried inside the plant cell, replicated and spread as part of the virus, and be expressed to produce the foreign gene product. Several laboratories in this country as well as in Europe have studied the basic molecular biology of CMV in order to test the idea. Some of them have concluded that CMV would not make a good gene vector based on their findings. However, an investigator at the University of California at San Diego has continued to study CMV. He has been able to overcome some of the problems encountered by other researchers. He is now in the process of constructing gene vectors from CMV and is planning to propagate such vectors in plants. It is expected that his work will conclusively determine the practicality of using the CMV genome to introduce foreign genes into plants.

Wheat Improvement Through Interspecific Hybrid. Wheat is one of the world's most important crops. The existing wheat cultivars have been fully exploited as a source of genetic variability by wheat breeders over the years. Genes that confer resistance to serious wheat diseases such as barley yellow dwarf virus (BYDV) have not been found among the known wheat cultivars, and wheat breeders have been increasingly looking at uncultivated species related to wheat as possible sources of disease and insect resistance. Agropyron is one such wheat relative that is resistant to BYDV and wheat streak mosaic virus (WSMV). Research is being conducted by Kansas State University investigators designed to transfer the resistant traits from Agropyron to wheat. They have successfully developed a method to produce interspecific hybrids between Agropyron and wheat, and have been constructing a series of interspecific hybrids such that each hybrid line would contain a known section of the Agropyron chromosome in the wheat background. Some of the hybrids will contain the Agropyron genes that confer resistance to BYDV and WSMV. They can be used immediately in wheat breeding programs. At the same time, the Kansas scientists plan to use these hybrids to investigate the molecular biology of the disease resistance genes.

Effect of Diet on Calcium Loss. A major health concern is that normal, healthy women lose calcium from their bones as they age; this leads to bone fragility and breakage. Studies at the University of California (UCLA) are underway to assess the effects of diet on this bone loss. Preliminary results show that bone calcium content is not affected by current calcium intake, but may be related to calcium intake during the teenage years. If more detailed studies confirm these data, this may lead to re-assessment of

recommended daily allowances of calcium for teenage girls. Scientists at the University of Connecticut have shown that calcium excretion in the urine is mediated by insulin; thus meals containing high protein or carbohydrate, which increase circulating insulin, lead to calcium loss. The effect of insulin appears to be to reduce re-absorption of calcium by the kidney, leading to its loss in the urine. This can have important dietary implications, and might suggest diets lower in insulinogenic foods in order to reduce calcium loss.

Vitamin B_6. Vitamin B_6 is an essential nutrient. It is converted in the body to pyridoxal phosphate, an important cofactor in metabolism. Serum levels are generally used to assess whether adequate vitamin B_6 has been ingested. Studies at Fort Wayne State Hospital in Indiana showed that the enzyme alkaline phosphatase hydrolyzes pyridoxal phosphate to pyridoxal; levels of this enzyme which are abnormally high (as in pregnancy) or low (as in the disease hypophosphatasia) lead to alterations in serum levels of pyridoxal phosphate, while tissue levels of pyridoxal phosphate remain normal. Thus, serum levels alone may not be adequate for assessing vitamin B_6 status; abnormal levels of alkaline phosphatase must also be taken into account.

Vitamin A in Pre-Term Infants. There has been concern recently that the bright lights used in nurseries in which pre-term infants are housed may affect their vision. Vitamin A, which is essential for vision, is very low in pre-term infants; presumably, their diets provide less vitamin A than would be obtained transplacentally. Studies at the University of Missouri are aimed at investigating nutritional requirements of premature infants. Special equipment for measuring electro-retinograms has been developed. Premature infants took longer to develop electro-retinogram responses than did normal, full-term infants. It was found that pre-term infants with extremely low vitamin A levels responded only slightly to oral vitamin A supplementation by having somewhat increased serum vitamin A level. Hence, it is important to find better vitamin A supplements which can be absorbed and metabolized by pre-term infants.

Dietary Fiber. There has been much interest lately in the importance of dietary fiber in improving uptake of nutrients by increasing transit time through the gut, and as diluent for carcinogens, hence as a protective agent against colon cancer. Also, there are suggestions that fiber can reduce cholesterol by binding bile acids and aiding their excretion. Using a rat model, scientists at Purdue University have shown that the type of fiber in the diet affects the amount of bile acid excreted, and the concentration of cholesterol in the liver. The type of fiber in the diet also affects the rate of development of the gastrointestinal tract, as shown by scientists at Georgetown University. Further studies with both rats and humans can point more specifically to the type of fiber with which our diets should be enriched.

BIOTECHNOLOGY, ANIMAL SCIENCE AND INSECT PEST SCIENCE

The Biotechnology, Animal Science and Insect Pest Science program areas were initiated by Congress in FY 1985. The following are examples of projects started under this initiative.

Moraxella Bovis Pilin: Molecular and Genetic Studies. Infectious bovine kerato-conjunctivitis (bovine pinkeye), caused by Moraxella bovis infection, ranks as one of the most wide spread cattle diseases in the U.S. and abroad, causing febrile conditions in animals, leading to slowed weight gain, decreased milk production and copious ocular discharges. Investigators from Stanford University propose to develop a vaccine for effective control of this economically burdensome disease. The investigators propose to clone the gene specifying the amino acid sequence of the M. bovis pilus, the bacterial appendage mediating attachment to epithelial cell surfaces, such as corneal tissue. Many bacterial infections can be effectively blocked by vaccines which induce immunity and antibodies against bacterial pili. The pilus of each type of bacteria differs from those of other bacteria. Thus, vaccines must be developed for particular types of bacterial infections. The investigators plan to prepare synthetic vaccine components and assess their ability to induce an immune response against pilin proteins and prevent attachment of M. bovis bacteria to bovine corneal epithelial cells. Immunogenicity studies will be carried out in calves to determine the efficacy of this novel vaccine to prevent bovine pinkeye.

Distribution and Biogenesis of Mammary Membrane Proteins. The lactating dairy cow is an important source of protein, produced to a major extent from feeds not available as human foods. The surfaces of mammary gland epithelial cells are the site for the secretion of all major components of milk, including protein, lactose sugar, triglycerides, and water. The formation and composition of the membrane structures are key factors in the regulation of milk secretion. An investigator from the University of Maryland plans to determine the structure and distribution of the fat-globule membrane glycoproteins using cell biological and molecular biological techniques. Some of these proteins are developmentally regulated, in that their expression and synthesis is specific to lactating tissue and to different stages of the lactation cycle. Experiments are being designed to test the hypothesis that the correct delivery and insertion of the membrane proteins into the plasma membrane requires a specific "apical routing signal" in the primary amino acid sequence of these proteins. The application of results from basic research in this area should, therefore, have a substantial impact on the production of milk, with economic benefits to both the dairy farmer and consumer.

Role and Mode of Action of Interleukin-1 in Mediating Immunologic Stress. Maximum growth and efficiency limits are set by the genetic composition of an animal. Environmental factors grouped under the term "stress" prevent the expression of maximal growth and production efficiency. A scientist, from the University of California, Davis, will investigate stress mediated by the immune system. This stress arises from the continual exposure of animals to a wide variety of microorganisms in the environment of modern agricultural or production facilities. Studies will be carried out to determine the mechanism by which Interleukin-1 (IL-1) influences animal metabolism. Specifically, the research will focus on the mechanisms by which IL-1 exerts its action on protein and mineral metabolism in isolated liver and muscle cells. The investigators feel that IL-1 influences animal growth by inhibiting the recruitment of new nuclei from muscle satellite cells, thus decreasing the number of new muscle cells and muscle fibers. These studies will provide new information concerning the immunologic influences on animal growth.

Isolation and Transformation of a Wound-Induced Trypsin Inhibitor Gene From Alfalfa. Plants contain an arsenal of defenses against pest attacks. A researcher at Washington State University has investigated wound-induced proteinase inhibitors. He has uncovered a system in which proteinase inhibitor genes are regulated by systemic factors (wound hormones) that are released from tissues by wounding during pest attacks. This system has provided not only the opportunity to isolate and study the structural and regulatory regions of genes involved in plant defense, but has provided an assay system to study the release, transport and reception of the wound-mediated signals. Thus, this system provides a model with which to contribute new information concerning the molecular basis of the regulation of expression of genes involved in plant protection.

Genetic Transformation of Citrus to Facilitate Hybrid Production. Cultivar improvement through genetic crosses in some citrus species is difficult because maternal nucellar embryos out-compete the zygotic embryos. The maternal nucellar embryo is derived entirely from the mother plant, while the zygotic embryo is the true offspring of the genetic cross between the two parental plants. Only the zygotic embryos grow to be the hybrid plants that interest citrus breeders. Both types of embryos are present in the seed produced as a result of genetic crosses, but it is impossible to distinguish them in the early stages of development. Often a citrus breeder must grow many seedlings for several years before some distinction can be made. A research project under the new biotechnology initiative offers a completely new way to solve this problem. A team of researchers at University of Florida will combine tissue culture and molecular biology technologies to establish the breeding stocks of citrus that possess an indentifiable marker. The marker is a foreign gene inserted into the stock plant using recombinant DNA technologies, and is designed to allow identification of the zygotic embryos in the very early stages of their development. The necessary basic research on the citrus tissue culture technologies was carried out with support from the plant science program of Competitive Research Grants Program. This research therefore represents not only a practical application of biotechnology to agriculture, but also an example to demonstrate how a basic research program of Competitive Research Grants Program contributed to the solution of a practical agricultural problem.

Molecular Biology of Plant Mitochondria. Mitochondria are the cellular organelles found in all eukaryotic organisms. They function in respiration and bioenergetics, and are known to contain their own genome. It has been demonstrated that the plant mitochondrial genome is much larger than that of animals or fungi, but the reason for this is not known. In several higher plants, the mitochondrial genome has been shown to play a role in cytoplasmic male sterility, an important genetic trait that is widely utilized for the production of hybrid plants. Detailed studies of plant mitochondrial genes have only recently become possible with the advent of recombinant DNA technologies. The new initiative in biotechnology has attracted several excellent research proposals in this area. Four projects were selected for awards. They include a study on the regulation of mitochondrial gene transcription (Cornell University), the development of methods to select for mutations in the mitochondrial genome (University of Washington), and the investigation of the molecular mechanisms of cytoplasmic male sterility in corn (Stanford University) as well as in sorghum (University of Florida). Rapid and significant advances in our understanding of plant mitochondria biology may be expected from these projects.

How Plants Adapt to Cold. Some plants are able to adapt to low temperature better than others. This hardiness is a desirable trait in cold climate crops. A scientist from Cornell University proposes to determine the molecular basis for cold hardiness. Previously, the investigator has shown that a freeze-thaw cycle disrupts the outer membrane of cold-sensitive plant cells. He will now examine the membrane lipids (fats) and their role in cold acclimation. A detailed analysis of the lipid composition will be made. He will isolate the lipids and cause them to form small, isolated sacs (liposomes). With the liposomes, he will study freeze-induced dehydration, mechanical failure, intracellular ice formation, and other injuries. An attempt to modify cell membranes by fusing isolated cells with modified lipids will be made. Although these studies are directly related to the structure and function of cold-stable cell membranes, they will have application in development of improved methods for cryopreservation of germplasm and, ultimately, for improvement in cold hardiness via genetic engineering.

The Causes of Stress-Induced Metabolic Events. When plants are exposed to environmental stresses such as drought, salt, or cold, a sequence of metabolic events occurs at the molecular level. These events lead to the accumulation of proline, an amino acid. Another response is wilting of the leaves, which is associated with accumulation of ABA, a hormone. It is possible that ABA and wilting lead to proline accumulation. An Iowa State University scientist is investigating the interrelation of these two major metabolic responses to stress. The researcher postulates that the environmental stresses change the expression of specific genes that code for proline-synthesizing enzymes. Using plasmids from mutant bacteria that over-produce proline under stress, it will determined whether there are homologous genes in plants. Then there will be an ability to "fish out" these genes, clone the DNA sequences, and transfer them to a vector allowing active synthesis of proteins. In this way, the proteins (enzymes) controlling proline synthesis can be identified. Knowledge of these basic responses to stress will lead to a better understanding of how to increase productivity of plants growing in marginal environments.

Affinity-Purified Juvenile Hormone Esterase and Its Gene for Bollworm Control. An investigator at the University of California, Davis, has recently discovered a high affinity, low abundance esterase in the larvae of bollworm, Heliothis. The esterase has been shown to be critical in metabolizing juvenile hormone leading to pupation. Induction of the esterase in young larvae will halt feeding and is, therefore, fatal. Using recombinant DNA technology, the investigator will determine the amino acid sequence of the esterase, isolate the gene and message, develop a transfer vector and evaluate the esterase for Heliothis control.

Host Resistance of Southern Yellow Pine to Bark Beetle Attack. Pine beetles represent a complex of scolitid beetles from the genus Dendroctonus as well as related genera. The beetles interact with one another and several plant pathogenic fungi to cause tree mortality. An investigator from the University of California at Berkeley will investigate these interactions in the West, with particular focus on the succession of species of beetles and fungi that predispose pines to attack by later, climax, species that ultimately kill trees. Another scientist from North Carolina State University will examine the resistance of southern pines to the southern pine beetle complex. This system involves the interactions between bark beetles and the defense chemicals provided by Southern Pines. Both studies are designed to understand the basic mechanisms of host-resistance to bark beetles.

Pheromone Biochemistry and Mating of Gypsy Moths. The female gypsy moth, like most lepidopterans, uses sex pheromones to attract males as a first step in the mating sequence. A scientist from the University of Massachusetts will study gypsy moth navigation in the field, laboratory wind tunnels and by electrophysiological recordings. The study will provide a comprehensive picture of how gypsy moth males locate females from distances as great as 100 meters. The information will ultimately be an aid in improving the mating disruption technique for control of gypsy moth. In a complementary study, an investigator from the State University of New York at Stony Brook will determine the interactions of soluble and membrane associated proteins with radio-labeled, chiral pheromone and pheromone precursors with synthetic pheromone-like enzyme inhibitors, and with photo-affinity labels. These, along with other studies, will allow for development of volatile sensory disruptants that render males unable to locate females.

Animal Pregnancy Maintenance. A major problem to be overcome in maintenance of pregnancy is embryo death in the first days of pregnancy. Successful pregnancy maintenance depends on biochemical "signals" from the conceptus which alter the mother's endocrine system. Specific proteins are secreted by the conceptus which in some way prevent corpus luteum regression and ultimately lead to successful pregnancy outcome. Scientists at the Universities of Florida and Tennessee are attempting to identify these proteins and determine the mechanism(s) by which they act. Sensitive bioassays for their detection will be developed which may permit prediction of pregnancy outcome.

Development of Brucella Vaccines. Eradication of bovine brucellosis is a major goal of the USDA. While attenuated Brucella abortus strains have been used in vaccination programs, studies on improved vaccines, preferably using non-viable Brucella, appear more desirable. Scientists at Cornell University are studying the effects of live and killed B. abortus cells on specific sub-sets of T-cells in the immune system. Other approaches are to clone B. abortus surface antigens and to examine these as potential vaccines. These approaches are being pursued by scientists at the Virginia Polytechnic Institute and at Iowa State University.

ANIMAL HEALTH AND DISEASE RESEARCH

The Animal Health and Disease Research (Section 1433, Public Law 95-113) formula program is directed to improving the health and productivity of animals and the welfare of producers and consumers of animal products; protecting human health through control of animal diseases transmissible to humans; minimizing livestock and poultry losses due to transportation and handling; and facilitating the effective treatment and prevention of animal diseases.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: Fiscal year 1985 is the seventh year in which the Section 1433 program has been active. Institutions receiving fiscal year 1985 funds include 38 State Agricultural Experiment Stations and 15 Colleges of Veterinary Medicine qualifying individually. Additionally, at 13 other universities, the Station and Veterinary College qualified as combined institutions. Legislative amendments contained in Public Law 97-98, December 22, 1981, provide that an "eligible institution" for Animal Health and Disease Research funds "means an accredited school or college of veterinary medicine or a State Agricultural Experiment Station that conducts animal health and disease research."

Recommendations of the Animal Health Science Research Advisory Board are being followed in program implementation (i.e., scope and priorities of eligible research, determination of research capacity of eligible institutions and other questions on program administration). In accordance with advice of the Board, emphasis in this research centers on the solution of high priority diseases or other animal health hazards in the production of livestock, poultry, and aquaculture species.

State Comprehensive Plans for animal health research, approved by CSRS are being followed by the eligible institutions within each State. These plans include the major areas of animal health research to be conducted by the institutions and mechanisms to assure effective coordination of research among the institutions. Provisions of Section 1433 project implementation permit selection of studies within each State based on highest priority needs and capabilities of the institutions to conduct the needed research.

Research is in progress on more than 400 projects seeking solutions to infectious and noninfectious diseases or parasite problems of food animals and horses. Strong emphasis is being placed on solution to respiratory, enteric and reproductive diseases. Other major problems such as mastitis, pseudorabies, brucellosis and toxic hazards are being investigated. Causes of disease are under study; new methods for disease diagnosis and carrier detection are being sought; new or improved treatments are being tested; methods of increasing resistance to disease are being developed; and biological methods to replace chemical control of livestock insects and internal parasites are being evaluated.

More than 100 projects were new in fiscal year 1985, providing redirection of effort toward particularly promising approaches. These new research efforts are being applied to solve problems of reproductive and respiratory disease and gastrointestinal parasites. New or improved vaccines are being developed to control these diseases and other high priority problems such as mastitis, salmonellosis, foot rot and TGE. New medical technology, including genetic engineering, monoclonal antibody and virus fingerprinting procedures, are being employed to accelerate needed breakthroughs.

Selected examples of recent progress:

Cause and Prevention of Pulmonary Emphysema in Cattle. Intensive studies by Washington scientists have established the cause and developed effective prevention strategies for pulmonary emphysema, a disease that affects cattle worldwide. This perplexing disease has been found to be caused by a toxin in lung tissue which forms following absorption of 3-methylindole (3MI), a product of digestion. The disease can be prevented by glutathione,

a cellular constituent that can detoxify the lung toxin and protect against 3MI-induced injury. These findings not only have contributed to the prevention of pulmonary emphysema in cattle, but they also have important implications to the understanding of lung injury in other animals and people. The Washington scientists have found that other animal species including primates develop this lung toxin on exposure to 3MI. It is postulated that the disease could occur in people through intestinal absorption of 3MI from certain food and in lung absorption from cigarette smoke.

Assurance of Safety for in vitro Fertilization of Embryos. Questions have been raised whether genetic abnormalities might be incurred during the process of laboratory fertilization of embryos, a process that is used with increasing frequency in animals and people. Michigan scientists have completed the first and only study, thus far, to assess the possibility of chromosomal damage during in vitro fertilization of nonhuman primate embryos. It was found that chromosomal abnormalities occurred at the same rate as that found in naturally fertilized embryos. Thus, there is no evidence to suggest a higher incidence of birth defects in embryos produced by in vitro fertilization. This finding has immediate application to the increasing research and commercial interest in this process in livestock and to the use of the process in humans.

New Vaccine for Control of Foot Rot in Sheep. Foot infection caused by a bacteria, Bacteroides nodosus, is the major disease affecting sheep in the western states and is a continuing problem in other areas of the country. The cost of foot rot outbreaks in western range flocks has been estimated at as much as $18 per ewe per year. Colorado scientists have completed the evaluation of a new vaccine in 500 ewes. The results clearly indicate that the severity of the disease was decreased in vaccinated animals, while in the controls the disease became worse during the test period. These results indicate that vaccination is a management tool that will help producers in their efforts to control and possibly eradicate foot rot due to B. nodosus. Studies are continuing to determine if there may be different serotypes of the causative organism for which the vaccine may be less effective.

Improved Test For Detecting Mycotoxins. Intensive studies by Missouri scientists have resulted in the development of a rapid, inexpensive analytical method for the detection of eight different fungal toxins which are harmful to animals and people. These are the most common mycotoxins found in grains and mixed feeds. The test permits the monitoring of large numbers of samples at minimal cost to livestock producers. Using this new procedure, the Missouri scientists in cooperation with State and Federal agencies, have been able to rapidly assess the severity of mycotoxin contamination in Missouri crops. This information has permitted early advice to be given to livestock owners and veterinarians when potential hazards existed, and provided regulatory agencies with data needed to allow grains to be moved interstate.

Cause and Prevention of the "Fat Cow Syndrome". A disease has been known for some years which causes dairy cows to become excessively fat during late pregnancy, with greatly increased risk of death. It has been assumed that this condition is due to obesity and, based on this assumption, prevention has centered on the use of poor quality, low energy diets to control weight gains. Michigan scientists now have found that the disease is associated with a sudden infiltration of fat into liver cells caused by a rapid loss of weight during late pregnancy. The earlier assumption of

prevention by low energy diets has been shown to be completely wrong and the disease can now be avoided by diets containing proper levels of energy in mid and late gestation. In related studies California scientists have developed a test that can detect early causes of liver abnormality due to the "fat cow syndrome". This test will be useful in warning of possible ill-effects in pregnant cows on marginal diets.

Flock Health Surveillance System. Modern day health management practices have minimized clinical disease in broilers on a day-to-day basis, but subclinical (unapparent) disease may still be present. The differential in production cost between the least efficient and most efficient grower is small and the control of subclinical disease can be a crucial determinant of success or failure. To assist in detecting and eliminating subclinical infections, Mississippi scientists have developed a system of surveillance of broiler health for Mississippi poultry producers. This system permits the identification of disease problems and provides remedial measures during the broiler grow-out period. Since the implementation of this computerized system three years ago, there has been a marked decline in broiler condemnations in Mississippi.

HIGHER EDUCATION

In fiscal year 1985, the Department conducted three higher education programs: the Morrill-Nelson Permanent Appropriation which provides $50,000 to every State and territory; Strengthening Grants to support resident instruction programs at historically black land-grant institutions and Tuskegee University; and Graduate Fellowships awarded to colleges and universities to stimulate the development of food and agricultural scientific expertise in targeted national need areas.

Current Activities: Legislative authority for the administration of funds appropriated pursuant to Morrill-Nelson legislation was transferred to the U.S. Department of Agriculture and targeted to the food and agricultural sciences by the Agriculture and Food Act of 1981. The program was formerly administered by the Department of Education and is considered a permanent appropriation. The current appropriation for this program is $2.8 million--$50,000 per State.

Fiscal year 1985 was the initial year of funding for the Strengthening Grants Program which supports resident instruction at the 1890 Colleges and Universities, Tuskegee University, and the University of the District of Columbia. Approximately $107,000 is available to each eligible institution under this program.

Funds appropriated for Graduate Fellowships in fiscal year 1985 were used to support the second year of training for some 302 graduate fellows. The agricultural science and education community, including the USDA, is concerned about the lack of public awareness and understanding of the multiplicity of career options available in the food and agricultural sciences. Many believe that the career image of agriculture as "farming and ranching" is a significant factor in explaining recent trends showing a 32% decline in undergraduate enrollment at land-grant colleges of agriculture from 1977 to 1984 and a 5% decline in graduate enrollment at land-grant colleges of agriculture during this same period. Unless interventive measures are taken, expectations are that these trends will continue through the remainder of this decade. There is expected to be an 8% decline of high school graduates in the 18 to 24 year old age category by the end of this century. Based on recent data, projections on the availability of expertise in the food and agricultural sciences are showing an approximate overall annual shortfall of 15%, with much higher shortages in some specific employment categories.

Selected examples of recent progress:

Morrill-Nelson funds currently are the only Federal Funds appropriated to support resident instruction programs in the food and agricultural sciences on a permanent continuing basis. The latest data available denotes use of these funds for faculty salaries, teaching equipment, program development, and other operating expenses. Administrative units having access to and reporting use of the monies to strengthen higher education in the food and agricultural sciences include agriculture, home economics, forestry, and veterinary medicine.

In fiscal year 1985, 18 proposals were received for funding under the Strengthening Grants Program. Proposals were required to target specific areas e.g., curriculum development, faculty development, library resources, instructional equipment, and student recruitment and retention. Of the 18 proposals received, 16 requested funds to assist with student recruitment and retention. This area stressed recruiting and retaining students, with special emphasis on competencies and skills deemed essential for success in food and agricultural areas. The remaining two proposals addressed the area of instructional equipment. Funds approved for use in this category were used to purchase equipment for instructor use to aid in the teaching of the food and agricultural sciences. The purchase of technological devices designed to support or improve instructional capabilities was also permitted. Primary emphasis was placed on equipment which could be centrally located and shared among departments for overall program enhancement.

Approximately $5 million were available in fiscal year 1984 to initiate the new USDA Food and Agricultural Sciences National Needs Graduate Fellowships Grants Program. All U.S. colleges and universities that confer a graduate degree in one or more of the food and agricultural sciences targeted for national needs fellowships were eligible to apply. Ninety percent of the funds were designated for the support of doctoral fellows and 10 percent for masters fellows. Across the national need areas, 35 percent of the funds were targeted to biotechnology, 25 percent to food and agricultural marketing, 20 percent to agricultural engineering, and 20 percent to food science/human nutrition. A total of 73 different institutions submitted proposals for graduate fellowships grants in fiscal year 1984. Based on peer panel review and evaluation, 67 proposals (46% of those received) were selected for funding. These 67 grants are supporting the recruitment and first year of training for 302 graduate fellows at some 47 different institutions in 35 States across the Nation. In fiscal year 1985 appropriations made available were used to support the second year of training for fellows at institutions which were funded in fiscal year 1984.

THURSDAY, MARCH 20, 1986.

EXTENSION SERVICE

WITNESSES

DR. ORVILLE G. BENTLEY, ASSISTANT SECRETARY, SCIENCE AND EDUCATION, UNITED STATES DEPARTMENT OF AGRICULTURE
DR. MARY NELL GREENWOOD, ADMINISTRATOR, EXTENSION SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE
DR. DENZIL O. CLEGG, ASSOCIATE ADMINISTRATOR, EXTENSION SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE
RICHARD R. RANKIN, DEPUTY ADMINISTRATOR, MANAGEMENT, EXTENSION SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE
STEPHEN B. DEWHURST, BUDGET OFFICER, UNITED STATES DEPARTMENT OF AGRICULTURE

EXTENSION SERVICE

Mr. WHITTEN. We are here today to meet with our friends from the Extension Service of the Department of Agriculture.

It has been very hard for me and other members of this Committee to understand the budget for the coming year. It is unbelievable, in that there seems to be little if any recognition of the need of the rural areas including towns of 15,000 or less, which cover 80 percent of the country. Many say it is because the rural farm vote has become so small in comparison to that of the cities; with only 2½ percent of our people on the farm today.

I would say for the record, and I think it is generally recognized by all members of this Committee and the Congress, that a great job has been done in our country by the Extension Service and agricultural conservation programs through the years. This has made it possible for so few to free the rest of us to do something other than provide the basics of life.

The origin of the high standard of living that we enjoy is the Land Grant College system and the Extension Service. It is just hard for me to understand how the people in high office can misunderstand the value of these program to agriculture, of our own country on upon which all the rest of our country depends.

In next year's budget, not only have the funds for the Extension Service been drastically cut but they have set out to get rid of the Soil Conservation Service. The testimony in the record is that they cut the funds for soil conservation work from $660 million in 1986 to $350 million for 1987. There is another $106 million proposed for 1987, but that is so as to arrange for the release of 700 employees proposed to be terminated.

I came here when much of the country was a dust bowl—when, if you lived on a farm, you were different from other people. There is an old speech I made some years ago pointing out that when people referred to the "wool-head" boys, it was not that they did not want

a cool hat in the summertime, they just did not have the money to buy one. In that old speech, I referred to their Sunday suit the one they wore on Sunday.

What I am talking about is this: For many, many years there was quite a distinction between rural people and city people, because the rural people got what was left. Through the years, by reason of law, we have become better able to correct this inequity through the Extension Service, the Soil Conservation Service, ACP and all the others.

Many people don't seem to realize what has been accomplished by all those services pulling together. Some years ago, we had an investigation by this Committee about the great job that was being done. Extension claimed the credit, Soil Conservation claimed it, ACP claimed it, the States claimed it. But there was enough credit for all to claim.

This year the President has asked Congress to increase the carryover for military spending from $244 billion at the end of the year to $299 billion at the end of next year to make that money available he proposes to cut the basic agricultural program. We have the highest standard of living in the world provided by a mighty few people on the farm.

I have tried to point out many times that the price of food, clothing and shelter is going to be paid—either by the person who buys it or by the land from which it comes. We are very lucky here. This Committee insisted and we got the colleagues on the Senate side to agree that whatever this new bill does, it can not serve to peel back the efforts that we have made through the existing programs for soil conservation; and I think we are going to win on some of these other things.

I don't question the motives of people. But it is just hard to see so little understanding by many people.

The other thing that is hard for me to understand is that the Administration refers to the people in the States and the Federal citizens. Well, they are one and the same thing.

In the Articles of Confederation, in the years 1781 to 1788, each State or Colony looked after everything within its boundary. Under this arrangement we did not have anything in the way of progress. So we where—and you have heard this before—we formed the United States of America to combine the strength of the entire Nation.

So I have no hesitancy in saying that just about every program we are proud of has been a Federal program. Why should it not be that way. In my state for many years we had an equalizing fund in education, where richer counties paid into a fund to give equal educational opportunities to poorer counties.

So as you come here, I want you to know that I don't know anybody on this Committee that is not your friend. When I say "your friend," they act to support you to see that we don't neglect our own country.

Often I facetiously have said that it looks like we are going to have to take all these domestic programs and give them a foreign address——[Laughter.]

Because the Administration is giving increased funds to foreign aid and increased military carryover where they will have a year's backlog of money if they ever run into tight financial times.

There are a whole lot of things I don't understand, but this budget proposal is one of the worst. How in the world anybody in a responsible position, particularly in the Department of Agriculture, can be a party to what has been recommended for next year is hard to accept.

Now we will be glad to have your statements. I want you to stress what the effect will be of the proposed cuts in your activity. I am sorry I could not be here yesterday but we have had to go along on this Committee and recommend money for many things such as mechanical harvesting. Then we found that if you are going to do it mechanically, you are going to need plants that will produce fruit that will get ripe about the same time. So one thing has led to another.

I am glad that you have had our support and we have had the support of the rest of Congress. I hope and trust we will still have it, but we certainly have a "hard row to hoe" in view of the recommendations that are made here in the budget for next year.

Without further adieu, I just want to say we welcome all of you. Dr. Bentley, I enjoyed being with you down in Mississippi. I don't know if when they arranged that whether or not they knew what a hard job we were going to face this year, you and the others.

Dr. Greenwood, we are glad to have you here.

Dr. GREENWOOD. Thank you.

Mr. WHITTEN. We will be glad to have you proceed in your own way. But before you are through—and I know you have to support the amount of your budget—I want you to tell us what you asked for and I want to tell you what the effects will be if we don't restore these funds.

Do you care to say something first, Dr. Bentley?

INTRODUCTIONS

Dr. BENTLEY. First, I appreciate the Committee having us here to talk about these topics. They are very dear to our hearts as well.

The comments you made remind me of good remarks of the Agriculture Day observation today, which is going on throughout the United States. Most people are recognizing the great contribution that our agricultural people, our food marketing/processing system, and our fiber production system are making to this country.

I would like, first, Mr. Chairman, to formally introduce the people from Extension that are here with me today: Dr. Greenwood, Administrator Extension Service, Dr. Clegg, the Associate Administrator, and Mr. Rankin, Deputy Administrator for Management and, our long-time colleague, Mr. Dewhurst, the USDA Budget Officer.

I will not have any additional comment at this time. I had the opportunity yesterday to place in the record a state-

ment concerning the activities of the Agricultural Research Service, the Cooperative State Research Service, the Extension Service, and the National Agricultural Library.

I must say, Mr. Chairman, we had a good discussion yesterday and we appreciated that very much.

I would rather that we turn now to Dr. Greenwood and ask her to make a statement concerning Extension.

Thank you.

Mr. WHITTEN. Thank you, Doctor.

EXTENSION BUDGET

Dr. GREENWOOD. Mr. Chairman, and members of the Committee, I appreciate the opportunity to again appear before you. I have submitted an official statement for the record. So, today, I would propose to just highlight aspects of that and do so very briefly to provide time for questions and comments that you may have.

The Cooperative Extension System, with its Federal, state and local partners, addresses concerns not only nationally, but at the state and local level. From my perspective, as that System performs its functions there are a number of concerns that are in the national interest; and I would simply identify these and not elaborate on them.

AREAS OF EMPHASIS

One is to provide nationwide leadership in adapting and transferring science and technology to our farmers, to our families, to businesses and communities across this country. Second, the System anticipates and responds educationally to critical national issues facing the food and agricultural system.

Third, we mobilize educational resources to respond to national disasters and catastrophes. That could be floods on the Mississippi, or a grasshopper outbreak in the west. Fourth, we also initiate nationwide targeted educational programs necessary for effective and timely implementation of Federal regulation and policy.

The last thing that I would mention which I think extremely important is developing a cadre of volunteers and leaders across this country who serve their organizations, their communities, as well as their Government.

One accomplishment from this past couple of years is the System's response to the farm financial crisis. While programs were initially designed and implemented in the Midwest, those programs are now being conducted across this country.

A survey we conducted last fall indicated that the Extension system has reached 100,000 families with intensive educational assistance, helping them develop individualized farm financial management plans. Another 80,000 families were reached by professionals trained by the Extension Service across the country.

Our assistance has been vital, I think, in helping farm families to decide whether to remain in farming, whether to supplement their current operations with off-farm employment or whether to seek another career. Assistance has been provided in terms of individualized counseling with farm families; it has included training of other professionals; it has included manning hotlines and counsel-

ing centers; and, equally important being a listener and counselor to individual families and community leaders nationwide.

Although a large number of families have been assisted, my state colleagues estimate that more than twice the number that we have reached will need comparable assistance in the near future; and I certainly would want to express appreciation to this Committee and to the Congress for the special allocations made in 1985 and 1986 to augment the efforts that the Extension system has initiated.

1987 BUDGET

I will turn now and address, very briefly, the 1987 budget, which would reduce the Federal Extension budget by roughly 60 percent. We would hope that states and local governments would be willing and able to assume increased financial responsibilities for programs that they deem to be of value. Under this proposed budget we have proposed elimination of all Smith-Lever 3(d) funds, as well as programs conducted under the Renewable Resources Extension Act.

HIGH PRIORITY CONCERNS

The proposed budget provides $135 million in general formula funds that would be allocated to our state cooperators. It is expected and anticipated that these funds would address high-priority national concerns, one of these being the restoration of profitability in American agriculture. A year ago I think I shared with you a document and projection of the System in which they identified aspects of programs that they would conduct in that regard.

We would also identify proper management of natural resources with emphasis on water quality and management, and particularly ground water. Here, again, our System has just gone through extensive review and projected programs to be conducted in that arena in the immediate future.

We would also identify rural development and, develop understanding of Federal regulations, policies and programs. An example of the latter would be implementation of issues in the 1985 Farm Bill. I would identify these as some of the issues facing this country that the Extension System is equipped to address.

There is no doubt that this proposal will force this unique System to change, to refocus. If the proposal is enacted, the impact on Extension would be significant. It would impact its role, its goals, its outreach. It seems to me that the Federal presence and investment is needed to make this System nationwide in scope and responsive to national as well as state and local issues.

This concludes my statement, Mr. Chairman. I would be glad to respond to questions.

[CLERK'S NOTE.—The full text of Dr. Greenwood's prepared statement appears on pages 885 through 889. The explanatory notes appear on pages 890 through 934.

REDUCTIONS

Mr. WHITTEN. The fiscal year 1987 budget proposes the termination of several programs and further proposes language to require that other services can be provided only after the needs of farm operators have been met. However, you also propose reductions in programs which you state are "ongoing high priority national concerns in areas such as, restoration of profitability to American agriculture, managing and conserving natural resources such as groundwater and highly erodible and dwindling crop lands" and others to assist farm operators to cope with the present crisis. How can you justify reductions in or terminations of programs developed specifically to provide financial management assistance to farm operators at this time?

Dr. GREENWOOD. We understand the importance of providing farm financial management assistance to farm operators, especially at this time. We anticipate States will use proposed formula funds to address this high priority need.

Mr. WHITTEN. Do you really expect the State and local partners of the Extension Service to pick up the slack in these efforts when many of them are also experiencing financial stress?

Dr. GREENWOOD. We recognize that many State Extension Services are experiencing budget reductions at both State and county levels and will not be able to maintain their farm financial management assistance programs at current levels.

Mr. WHITTEN. How do the priorities expressed in your fiscal year 1987 budget request compare to the provisions in Title XIV of the Food Security Act of 1985?

Dr. GREENWOOD. Major provisions of the Food Security Act of 1985 address the need to enhance the profitability of the American farmer by expanding markets, increasing efficiency and doing more with exports. Also addressed is this nation's commitment to preserve our national resources. The emphasis of using Federal funds to provide Extension programs in these areas is consistent with the goals of the Food Security Act.

ELIMINATION OF EARMARKS

Mr. WHITTEN. How can you rationalize elimination of programs such as the Expanded Food and Nutrition Education Program, the urban gardening program, the farm safety program, Renewable Resources Act programs, and others, and then cite in the explanatory notes examples of how these programs have assisted middle-income families and farm operators?

Dr. GREENWOOD. The proposed elimination for earmarked extension programs primarily result from the need to set priorities within the increasingly constrained Federal budget.

FUNDING REQUESTS

Mr. WHITTEN. Please submit for the record the funding levels you requested from the Assistant Secretary for fiscal year 1987, the levels the Assistant Secretary requested from the Secretary, the levels the Secretary requested from OMB, and the OMB allow-

ances, including the original OMB allowance and subsequent revisions thereto.

[The information follows:]

Agency/Assistant Secretary Request	$390,000,000
Department Request to OMB	283,777,000
OMB Allowance	140,000,000

FARM FINANCIAL MANAGEMENT ASSISTANCE

Mr. WHITTEN. The Food Security Act of 1985 amended Section 502 of the Rural Development Act of 1972 by adding a new section providing special grants for education and counseling programs for farmers adversely affected by the rural economic crisis or those who have been displaced from farming. Has this program been assigned to the Extension Service?

Dr. GREENWOOD. No specific assignment of this program has been made.

Mr. WHITTEN. If so, how do you expect to operate it within the restrictive nature of your fiscal year 1987 budget request?

Dr. GREENWOOD. No new program initiatives are planned within the FY 1987 budget request. Considerable redirection of program resources has already been made to assist farm families adversely affected by the rural economic crisis.

Mr. WHITTEN. Is the Extension Service taking any steps to implement this program? If so, please provide the appropriate material for the record.

Dr. GREENWOOD. No specific steps have been taken to implement this program.

Mr. WHITTEN. To how many farm families did you provide financial management assistance during fiscal year 1985? To how many do you expect to assist in fiscal year 1986?

Dr. GREENWOOD. This program has been very successful nationwide in our view. A national survey was conducted in August, 1985, to determine Extension System's response to the farm financial crisis. The data gathered in the survey indicated that during the past two years almost 100,000 farmers had been provided highly intensive individualized assistance. During the fall and winter months of 1985–86 still additional numbers of farmers have been provided this type of assistance—probably another 50,000. Extension programs have also helped provide intensive assistance indirectly by substantially expanded training programs for professional staff of agricultural lenders, vocational agricultural teachers, etc. Our data indicates that another 80,000 farmers were assisted through these efforts.

Mr. WHITTEN. How much Smith-Lever funds are being spent on this program in fiscal year 1986? How much non-Federal money is being spent on the program?

Dr. GREENWOOD. From various various survey studies we estimate that 20% of the total resources available to the State Extension Service from all sources are being used to provide Farm Financial Management Assistance in FY86.

Mr. WHITTEN. How and where is the funding for this program allotted and being spent?

Dr. GREENWOOD. All State Extension Services are conducting Farm Financial Management Assistance programs, and all States have expanded these programs in recent years. In areas where the farm financial crisis is most severe Extension has redirected resources into this program to the extent that 30 to 40% of all resources are being used for providing farm family financial assistance. Also, Extension Service, USDA utilized the $1 million special appropriation provided by Congress for FY85 to fund 18 special projects in 22 States to further strengthen and expand Extension's Farm Finanical Management Assistance programs. The $1.4 million provided for FY86 has been used to fund 20 such special projects.

Mr. WHITTEN. Please provide for the record a few examples of the type of assistance provided farm families in fiscal years 1985 and 1986.

[The information follows:]

Following is a report indicating how the Cooperative Extension System has responded in providing assistance to financially distressed farmers. This report entitled "Cooperative Extension and Agricultural Profitability—Intensive Assistance to Financially Distressed Farmers" provides information from a survey of all State Extension Services. These reports indicate that about one-third of all financially distressed farmers were provided intensive assistance in the last two years by Extension. Also, descriptions of the Extension program in a few States are summarized in this report. Listed below are some individual farmer case examples of Extension work throughout the country:

Kansas—A county agent used the set of FINPACK financial management computer programs in working with a farmer where his banker had refused to renew his operating loan. The FINPACK programs were used to calculate 15 different farm plans all of which were feasible alternatives to the county agent and to the farmer. However, the banker refused to accept any of these plans. Additional plans were then prepared using more conservative prices and enterprises. Finally, the banker was willing to accept one of the plans and the operating loan was extended.

Minnesota—County agents used FINPACK to assist a hog farmer in preparing a farm plan and cash flow project which was accepted by FmHA for a low interest operating loan. The farmer had been previously turned down by PCA unless the farmer could come up with more collateral. Also, the farmer was able to use the revised farm plan to renegotiate on a Federal Land Bank loan to receive a lower interest rate. Total payments in the first year were reduced $33,000.

Nebraska—This family knew that they had a cash flow problem, but were not really motivated to make any hard decisions yet. A FINPACK run of their existing operation showed that their new worth of $200,000 was eroding at the rate of $50,000 per year.

As Extension staff proceeded to work with them, the husband felt that the low hog prices were the root of their problem. We asked him for his most optimistic estimate of hog prices for the next five years. A FINPACK run was made with that price, and it showed that his net worth was still eroding rapidly. They proceeded to partially liquidate their operation, rent out part of it, and are still farming part of it. They should be able to save 25% of his land since they took action.

Tennessee—A young farm family with a 30-cow herd planned to expand to an 80-cow herd. Extension personnel reviewed records and assisted in developing a detailed farm plan. The family recognized the risks associated with the expansion. The husband obtained an off-farm job while the wife operates the 30-cow herd. They plan to accumulate equity and evaluate expansion later.

Ohio—A county agent met four times with a young farm family who had a debt/asset ratio of 80% and were having difficulty meeting operating expenses, debt services, and family living costs. They had reduced their crop operation from 1400 to 500 acres. Numerous alternatives were reviewed. A solution was reached which involved selling excess equipment, the wife seeking off-farm employment and the husband seeking off-farm seasonal employment. The solution provides sufficient cash flow to meet current needs.

Cooperative Extension and Agricultural Profitability--

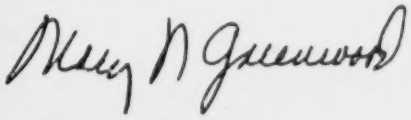
Intensive Assistance for Financially Distressed Farmers

Extension Service
U.S. Department of Agriculture

November 1985

FOREWARD

The following report delineates how the Cooperative Extension system is continuing to respond and adjust its programs across the Nation to deal quickly and effectively with the farm financial crisis and its subsequent impacts on American agriculture, farm families, and rural communities. Extension programs have shifted rapidly to provide farm families with intensive assistance on their financial problems and related health and stress problems. The survey data on which this report is based indicates that Extension programs will continue to expand still further in this area during the coming year.



Mary Nell Greenwood
Administrator

COOPERATIVE EXTENSION AND AGRICULTURAL PROFITABILITY -- INTENSIVE ASSISTANCE FOR FINANCIALLY DISTRESSED FARM FAMILIES

INTRODUCTION

As America's farmers reap the bountiful harvest of 1985, many of them must now come to grips with the grim reality of the continuing financial crisis in agriculture. A large number of the Nation's 2.3 million farms now suffer some financial difficulties with many of them facing serious survival problems.

Stagnant crop prices, falling land values, and a disappearing export market are further compounded by stress-related family problems, including suicide and divorce. The foundations of rural America -- its farmers, families, communities and related businesses -- are all now impacted in some way by the farm crisis.

Across the country, the Cooperative Extension system with its network of state and county field staff is redirecting people and resources to respond to this crisis. Programs and resources focus on farmers, their families, rural communities, agribusinesses, and related social services and lending institutions.

The short-term target is to provide intensive assistance to almost one-third of the Nation's farm families in critical financial distress. The long-term objective of this integrated, multidisciplinary Extension approach is to improve profitability in agriculture.

NATIONWIDE SURVEY

An August 1985 nationwide survey of states indicates that the Cooperative Extension system continues to accelerate its efforts in responding to the immediate problems of those U.S. farm families who are facing severe financial problems. The survey covers 2 years from October 1983 to the present and provides estimates of need for intensive assistance in the coming year. Based on the estimates of Extension professional staff across the country, survey results reveal that:

95,600 farm families received intensive assistance* in the last 2 years in developing a revised farm business and financial plan. Of these families--

- -- 48 percent (almost half) plan to continue farming full-time
- -- 8 percent plan to make the transition out of farming
- -- 24 percent plan to farm part-time with supplemental income from off-farm sources.

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* Intensive assistance as defined by the survey questionnaire is "when a farm family has been assisted in preparing or revising individual financial statements, cash flow projections, and/or a farm business plan of action that is expected to improve their financial affairs."

260,000	farm families (more than twice as many as have already received Extension assistance) need intensive assistance in the next 12 months.
63,525	farm families (about two-thirds) of those previously assisted need additional assistance in the next 12 months.
12	states provided hotlines with an estimated 18,000 calls received to date.
14	states provided counseling centers with an estimated 6,000 people assisted to date.
36,325	farm families were provided intensive assistance with major stress problems. However, it is estimated that Extension educational programs provided information to a total of 167,000 farm families on family problems such as health, marital instability, and stress problems which are related to financial crises.
15,600	agricultural professionals -- lenders, consultants, vo-ag teachers--received indepth training in how to provide intensive assistance to farm families with financial problems. These professionals used this training to provide intensive assistance to
- 80,000	farm families in the last 2 years. An estimated 96,000 more farm families will receive this type of assistance in the next 12 months from an additional 17,000 professionals who will be trained by Extension.
8,000	rural non-farm businesses and community organizations received intensive assistance in financial planning from Extension. The number needing this assistance in the next 12 months is estimated to be four times greater -- 32,000.

In approximately two-thirds (2,002) of the Nation's counties, Extension has provided intensive financial management assistance. Limited numbers of temporary personnel (about 300) and volunteers (about 130) are being used, but this number will increase substantially in the coming year.

Program delivery systems for each farm family include one or more of the following: one-on-one assistance, including farm visits; workshops; publications; preparing cash-flow projections; farm record analysis; and computer-assisted farm financial planning. The Minnesota-developed computer analysis program, FINPACK, is being adapted and used by 50 percent of the states. Program delivery systems for agricultural professionals and non-farm businesses and organizations include small group meetings, workshops, multimedia efforts, and related materials.

Delivery Methods/Procedures Used To Assist Financially Distressed Farm Families, By State (1983-1985)

State	Delivery Methods/Procedures						
	One-on-One Consultation	Small Groups/ Workshops	Computer Analysis	Publications and Media*	Hot Line	Counseling Center	Other**
Alabama	XX	XX		XX			.
Alaska		XX	XX				XX
Arizona	XX	XX					
Arkansas	XX	XX	XX				XX
California		XX	XX	XX			
Colorado	XX	XX		XX	XX	XX	
Connecticut	XX	XX	XX	XX			XX
Delaware	XX		XX				
Florida	XX	XX	XX	XX		XX	XX
Georgia	XX	XX		XX			
Hawaii	XX	XX					
Idaho		XX			XX		
Illinois	XX	XX	XX		XX	XX	XX
Indiana	XX	XX		XX			XX\
Iowa	XX	XX	XX	XX	XX		XX
Kansas	XX	XX	XX	XX	XX		XX
Kentucky	XX	XX	XX	XX		XX	
Louisiana		XX		XX			
Maine	XX	XX	XX	XX		XX	XX
Maryland		XX		XX			XX
Massachusetts	XX	XX					XX
Michigan	XX	XX	XX	XX	XX	XX	
Minnesota	XX	XX	XX		XX		XX
Mississippi	XX	XX				XX	XX
Missouri	XX	XX	XX	XX	XX	XX	XX
Montana	XX	XX					XX
Nebraska	XX	XX	XX	XX	XX	XX	
Nevada	XX	(p)***					

*Includes publications, radio, TV, video and press activities.
**Other delivery methods/procedures include home study courses, working through lenders and other organizations, referrals, and personal correspondence.
***Planned

Delivery Methods/Procedures Used To Assist Financially Distressed Farm Families, By State (1983-1985) (Continued)

State	Delivery Methods/Procedures						
	One-on-One Consultation	Small Groups/ Workshops	Computer Analysis	Publications and Media*	Hot Line	Counseling Center	Other**
New Hampshire	XX	XX					XX
New Jersey	XX	(p)					XX
New Mexico	XX	XX		XX			XX
New York		XX		XX			
North Carolina	XX	XX	XX				
North Dakota	XX	XX	XX	XX		XX	XX
Ohio	XX	XX	XX		XX	XX	XX
Oklahoma	XX	XX		XX	XX	XX	
Oregon	XX	XX					
Pennsylvania		XX	XX	XX			XX
Puerto Rico	XX	XX					XX
Rhode Island	XX	XX					
South Carolina	XX	XX	XX	XX			
South Dakota	XX	XX		XX			XX
Tennessee	XX	XX					XX
Texas	XX	XX		XX			XX
Utah		XX					
Vermont	XX	XX	XX	XX		XX	XX
Virgin Islands		XX		XX			XX
Virginia	XX	XX		XX		XX	XX
Washington		XX		XX			XX
West Virginia		XX					XX
Wisconsin	XX	XX	XX	XX			XX
Wyoming		XX			XX		XX

*Includes publications, radio, TV, video and press activities.
**Other delivery methods/procedures include home study courses, working through lenders and other organizations, referrals, and personal correspondence.
***Planned

PROGRAMMING FOR THE LONG RUN

The intensive efforts described are equipping farm families to deal with the current financial crisis. Longer running programs are needed to enable American farm families to restore profitability to their farming operations. Proposed Extension efforts in this area incorporate systems approaches that utilize production, management and financial programs to focus on increased profitability. Such approaches may utilize the emerging CORNPRO, WHEATPRO, AND BEEFPRO programs and the existing Integrated Reproduction Management (IRM) and Integrated Pest Management (IPM) programs. FINPACK and other financial analysis programs help farmers to identify the most profitable enterprise combinations for their specific farm operations. Marketing systems and other computerized support packages are another important dimension that must be considered. This systems approach will involve multidisciplinary teams with the goal of working with farm families on specific problems.

HIGHLIGHTS OF EXTENSION ASSISTANCE PROGRAMS

Due to a combination of factors -- including adverse weather, decreasing prices, fewer wheat and grain exports, and sharp decreases in land values -- farm families in the Midwest and Northern Plains are still the most severely impacted by the farm financial crisis. But survey data from other regions indicate that the problem is intensifying nationwide.

Most state Extension Services provided accounts of specific examples of intensive assistance to farm families. These range from helping farm families develop alternative financing arrangements...to helping with plans to move out of farming...to assisting with plans to improve current financial management. Space does not permit including all these accounts in this report, but some representative examples appear in the following section.

MINNESOTA

The average earnings of full-time Minnesota farmers dropped to a new 30-year low in 1984. Minnesota is losing a higher percentage of farms than the national average. In mid-1985, it was estimated that there were 5,000 fewer Minnesota farm operators than a year earlier--the largest drop in the Nation. However, there is little chance outside the Twin Cities area for off-farm employment.

About one-third of Minnesota farmers have significant cash flow problems. Approximately 25,000 farm families have or have had a strong need for assistance in revising their farm financial plans. Minnesota Extension reached approximately 15,000 farm families during June and July of 1985 alone through existing farm financial programs and a special program--Project Support.

Project Support is a program for farm families who need financial planning, stress management, and support. It is designed for farm families in three areas: families who have recently left farming or will shortly do so; farm

families who need help in analyzing their short-term financial situation and might leave farming, and farm families who will continue to farm. The goal of Project Support is prevention--which means trying to reach farm families before they become distressed financially and emotionally.

Minnesota recently established a telephone hot line to assist financially distressed farm families. During the last 6 months Extension handled over 6,000 calls.

Minnesota's computerized financial management program, called FINPACK, assists farmers in crucial management decisions, including: long-range planning, monthly cash flow projections, crop and livestock alternatives, end-of-the-year analyses, and trend projections. FINPACK is now in use in 25 states nationwide. Minnesota Extension also trained county Farmers Home Administration staff to use the program.

Since December 1984, a new Farm Financial Management Center has provided educational programs for farmers and those who serve them. The new center brings people and resources together from across the country for training and development of practical tools for Extension's use in future farm financial management educational programs. Development work on the FINPACK program was a first project of the Center.

MICHIGAN

Michigan Extension has approached the farm financial crisis with an intensive system of counseling and assistance, including the development of video and audio tapes on Family Communication During Stress and Crisis. Extension Management Assistance Teams (EMATs) have provided comprehensive assistance to over 200 farm families since January 1985. Teams consisting of district farm management agents, agricultural agents, and home economists meet with distressed families identified by county staff. The EMATs work with the entire family to develop strategies for managing in times of crisis.

For example, an EMAT augmented by an Extension beef specialist and crop specialist visited a farm in crisis, spending a day reviewing the facilities and analyzing the family situation. The team developed a plan for the farm which identified strengths and recommended changes. This report recommended the transfer of debt for better terms, change in crops, computer cash flow analysis, and off-farm employment. Follow-up with the family showed they had implemented the recommendations including refinancing the loan, the wife returning to work, the husband obtaining part-time employment, and crop rotation. The family was positive about the EMAT and the solutions they had worked together to develop.

Other Michigan farm families have benefited from Farm Cash Flow Workshops and computer assisted financial management strategies developed by Michigan Extension. Overall, over 1,500 families in crisis have been assisted by Extension.

IOWA

With agriculture comprising 80 percent of the state's economy, the farm crisis situation in Iowa continues to worsen. Thirty percent of the farmers have a 70 percent or more debt-to-asset ratio. Many desire off-farm employment, for themselves or family members, but opportunities are limited and declining as agribusinesses suffer financially along with farmers.

Iowa Extension is directing approximately 45 percent of its programs and resources to cope with the continuing farm crisis. In addition, the State of Iowa provided $200,000 extra funding to Extension in FY 1985 for work with the financial crisis.

Iowa Extension's ASSIST program continues to help farmers, 8,000 of whom have been reached thus far, in analysis of options for servicing debt, cash flow, and work with lenders. Over 10,000 Iowa families have learned to deal with the stress generated by financial problems by using a home study course on stress management. Similarly, 4-H is training staff to recognize and deal with stress in young people.

The Rural Concern hot line was established by the governor and is managed by Extension. FmHA has contributed $75,000 toward funding this service, and other state and private sector sources are also providing funds and support. More than 40 calls per day are received over the hot line from stressed farm families. Home Economics Extension has informed and involved community leaders in helping farm families in crises. More than 1,200 copies of "Farm Families Facing Economic Hardship--The Emotional Needs of Those at Risk," have been distributed at community meetings.

Iowa has worked intensively with 3,500 agricultural lenders and professionals (lawyers, clergy, social workers, teachers) and 2,000 non-farm businesses and organizations to train people to work with financially distressed farmers. In turn, these groups have worked with approximately 25,000 of the state's farm families on financial and stress-related problems. Extension has assisted in development of community resource committees in two-thirds of Iowa's counties. Self-help and peer counseling groups exist in half the counties with linkages statewide. Iowa is developing new programs to address the ripple effects now impacting local communities because of lowered retail sales, non-payment of taxes, and out-migration. Local business management, economic and leadership development are emphasized.

ILLINOIS

The 1984 labor and management income for Illinois farm cooperators averaged a minus $6,973 which compares to $6,465 for 1983. The data, published in the 1984 Summary of Illinois Farm Business Records, comes from farm business records of 7,842 Illinois farms. This makes the fourth consecutive year that Illinois farmers have shown a negative return. It is expected that about one-half of Illinois farms will not generate enough income in 1985 to maintain their net worth.

Illinois Extension estimates that during the past 2 years, 30,000 farm families have had or continue to have severe financial problems and have a strong need for assistance in revising their individual farm business and financial affairs. Illinois Extension has provided extensive assistance to approximately 5,000 families. About 2,000 of these farm families will need further assistance in the next year, while about 10,000 families not previously assisted will require help in developing revised financial plans.

A special project--Rural Route--provides intensive educational assistance in financial planning and management to farm families. The Illinois project consists of two primary features: (1) a toll-free, hot-line telephone service, and (2) confidential farm financial counseling.

Approximately 700 farm people have used the hot-line service. Calls to the hot-line are referred to field counselors who provide one-on-one counseling. Approximately 200 field staff are trained in farm financial analysis. Two farm financial counseling centers coordinate counseling activities for two large sections of the state--Western and Southern Illinois. The centers have assisted approximately 1,200 persons.

NEBRASKA

Nebraska farmers carry the highest debt-to-asset ratio in the United States. Financial stress is the major problem of most farm families. Since October 1983, Nebraska estimates that 30 percent of these families have had or presently have severe financial problems and are in need of farm financial assistance. During this time Nebraska provided intensive assistance to more than 1,627 farm families in developing revised individual farm business and financial plans. Of these families, about 1,387 received assistance in developing a plan which most likely will enable them to continue farming full time. Nebraska estimates that 10,000 additional farm families will require assistance with their financial plans between now and September 1986.

Managing for Tomorrow -- This financial management program for farmers and ranchers integrates microcomputer analysis of the present business situation with economic projections for the future. The program combines 20 hours of group training with 12 hours of individual consultation. Farm couples pay a $200 user fee to participate. Approximately 600 couples enrolled in 34 workshops held late 1984 and early 1985. More participants are expected in late 1985 and throughout 1986.

Counseling Centers and Hotlines -- Nebraska Extension assisted approximately 450 families in Farm Financial Counseling Centers open from February to April 1985. Located at the five Nebraska Research and Extension Centers and at other strategic locations throughout the state, the centers focused on borrowers from commercial banks, production credit associations, and the Federal Land Bank who needed immediate assistance. Farmers could access the centers through their local county Extension office or by calling the toll-free Farm Financial Information Line.

NORTH DAKOTA

Approximately one-third of North Dakota's farmers are experiencing serious cash-flow problems. Since October 1983, Extension has provided intensive assistance to 4,500 of these farm families in developing farm business and financial plans. Extension assisted another 450 farm families who developed a plan which involved some family members working off-farm; another 450 farm families were aided in making a transition out of farming. About 4,500 farm families sought help with major stress problems, and 700 farm families visited 56 Counseling Centers in the last 10 months. A "Tools for Profit and Survival" Kit is used extensively by North Dakota Extension in financial management workshops. The kit includes instructional materials, such as a balance sheet, income statement, cash flow budget and market plans to evaluate a farm's financial situation.

Another North Dakota farm management program -- the Farm Financial Anaylsis Service -- provides one-on-one assistance to farmers who need additional instruction in completing a thorough financial analysis of their farms -- 56 farm analysts now work across the state in this effort. Extension provides intensive assistance to volunteers from the community such as agricultural lenders, consultants, vocational agricultural teachers and other professionals to assist in reaching and teaching farm families. For example, 160 of these leaders were trained in 1985 and an estimated 50 more will be in 1986. North Dakota estimates that another 1,200 farm families will need intensive assistance from now through October 1986.

MISSOURI

Missouri leads the Nation in the number of farm bankruptcies. Since October 1983 almost 27,000 farm families across the state have experienced or are experiencing severe financial problems. During the last 2 years, Missouri has provided intensive assistance to approximately 2,700 families in developing revised individual farm business and financial plans. About 90 percent of those helped require further assistance. An additional 3,000 farm families will need assistance in developing plans during the next year.

Missouri provides farm families with financial management guidance and information through the following programs:

MOFARMS -- Missouri Financial Advisory Resource Management Support is a joint project of Extension and the Missouri Department of Agriculture. The Extension-trained farm financial consultants and home economists work with families to: identify strategies for coping with financial stress, review their current financial situation, develop an individualized financial plan, and explore alternatives to farming through vocational assessment referrals. The MOFARMS Referral Center received 633 calls for consultant assistance during the first 6 months of the program. Calls have come from 94 of Missouri's 114 counties.

Community Support Networks -- This program mobilizes resources of agencies, institutions, and volunteer groups, educating them about the farm financial situation and encouraging them to extend their services to needy local farm families.

Educational Programs -- Financial Management Seminars are targeted at agricultural lenders and the development of agriculture finance clubs for farmers. Extension staff also assist farm family members in identifying marketable skills, finding off-farm job opportunities, preparing resources, resume preparation, and related topics.

NORTH CAROLINA

Although North Carolina has not experienced the intensity of financial distress that many other states have, more farmers are now beginning to suffer serious financial difficulties. Extension is currently mobilizing its resources to better address these needs. In North Carolina, agriculture is the leading income producer behind tourism, bringing in $4 billion a year. With approximately 6 to 8 percent of the state's farmers expected to go under this year, rural communities are also jeopardized because of their strong dependency on agriculture and textiles, both now troubled industries.

Since October 1983, North Carolina estimates that some 2,250 farm families have received intensive assistance in developing revised farm business and financial plans. Extension also provided intensive training to an estimated 1,000 agricultural lenders, consultants and other professionals who in turn worked with 4,000 distressed farm families. Managing for Tomorrow, a farm crisis program focusing on financial decisionmaking, and farm family stress, family home expenses, and community resources, will reach families in 50 North Carolina counties in 1985 and '86.

Marketing '85, an important Extension education program, focuses on agricultural futures, hedging strategies, forward pricing, and agricultural options. Extension held 12 workshops with over 1,000 farmers, lenders, and others attending. Extension staff are also working with farmers to reduce costs of production, and have identified over $.5 billion in potential savings. North Carolina installed a new hot line staffed by former Extension workers for farmers to call on farm management issues with referrals to other agencies where appropriate. The first Extension counseling centers are planned for next year with employment of 25 temporary counselors. North Carolina estimates that 25 percent of its resources will be directed to the farm crisis in 1986.

VIRGINIA

Financial difficulty is a growing problem for farmers in all parts of Virginia. Extension farm management agents are responding to requests for individualized assistance from farmers, county Extension agents, ag lenders and suppliers. Volunteers, trained in financial evaluation and stress management, assist farm families in assembling the necessary information about their farm business in order to complete a thorough business and financial analysis.

Records technicians--part-time employees--promote and assist recordkeeping efforts of farm families as they develop strategies to deal with their current financial situations. Participants in this recordkeeping program meet in groups to learn about farm business and financial management. In addition to the group meetings, families are assisted individually by the records technicians, county agents, and farm management agents.

To strengthen the financial analysis efforts and skills of Extension personnel and those non-Extension people involved with farm families, Virginia provides training sessions in farm financial analysis. Information on psychological stress is also offered.

TENNESSEE

In the last 2 years, Tennessee Extension estimates that between 25,000 and 30,000 farms families have been severely effected by the farm crisis. During that period, Extension intensive assistance has helped an estimated 4,000 farm families revise their individual farm business and financial plans. Of that number, it is anticipated that nearly 2,050 will continue farming on a full-time basis, nearly 1,375 families will combine off-farm work to stay afloat, and about 435 will leave farming entirely.

Well over one-fourth of the farm families assisted were also counseled for major stress problems. Tennessee estimates that an additional 24,430 farm families in the state will need help in revising financial plans between now and October 1986. In the past 2 years, Extension trained over 430 Tennessee agricultural lenders, consultants, and other professionals who, it is estimated, have assisted some 5,000 families--and Extension plans to train another 200 non-Extension people in the next year.

Small farm families are hardest hit in the state. One dairy farm family in mid-state was under tremendous financial pressure. The father of the family had died about 6 years ago leaving a substantial debt load for the 130-cow dairy herd farm. His widow and son, now managing the operation, lacked about $40,000 per year to make their operation successful from a cash-flow basis. The local Extension agent worked with them in developing alternate plans. The herd size was reduced to 80 cows to match the land resource base, and other necessary changes made. The result was a $30,000 improvement in the cash-flow position with more adjustments planned.

TEXAS

Of the more than 7,450 Texas farm families in severe financial stress, over 5,700 have received intensive assistance from Extension. Of those helped, 1,865 will be able to continue full-time farming, and 3,785 will seek off-farm work to supplement income from farming and ranching. Only 100 plan to leave farming. Texas is devoting 30 percent of its resources to programs designed to help farm families deal with specific financial problems.

Extension staff estimate that more than 11,100 additional Texas farm families will need help in developing revised financial plans in the next year, while 3,785 of those already assisted by Extension will require further aid.

In cooperation with the Texas Department of Agriculture, Texas Extension (1890 and 1862) continues to hold workshops specifically for Hispanic farmers in southeastern and central Texas and Black farmers in central and northeastern Texas. Subject-matter of the workshops, at which all ethnic groups are welcome, includes: land retention, marketing farm products, farm loans, lending agencies, loan security program, and assistance available from agencies and organizations.

The major objective of the Texas Intensified Farm Planning Program of 1890 Cooperative Extension is to enable farm families to increase agricultural income through intensive educational assistance in agriculture production, management, and marketing. In 1 year, over 1,050 small farmers received intensive one-on-one assistance. In addition, over 2,000 distressed rural homemakers learned money and meals management. Microcomputer courses are scheduled for the next year for farmers, ranchers, and agribusinesses. Extension, with several cooperators, also conducted workshops aimed at introducing small farmers to new, innovative small-farm management techniques. Another project involves teaching the establishment of new farmers markets statewide through one-on-one contact and group sessions.

WYOMING

Approximately 10 percent of Wyoming's 5,650 farms and ranches are now insolvent and will be phased out of agriculture this year, a state survey estimates. With 80 percent of agricultural cash receipts from livestock and a troubled industry statewide, ranching areas have been the hardest hit.

Wyoming Extension educational efforts are influenced by distances in most of their 23 counties, and all county offices are involved in providing intensive assistance to farm and ranch families. Agents are working with people who saw Wyoming's farm and ranch incomes dropping faster than in any other state from 1973-1982, and who now face a 1984-85 "close out time" as farm and ranch foreclosures increase.

Even with the distance factor, Extension workshops in financial management, recordkeeping, cash flow, and other management skills are well attended. An ongoing series of 10 workshops in the fall and spring for young farm couples is one example. A regional workshop emphasis is planned for crisis assistance in 1986, as well as increased small workshops and one-on-one counseling. Extension developed a software package that bankers and other lenders are using to assist farm families in budget and financial analyses. Extension also held a "Holistic Ranch Management" workshop with emphasis on hands-on computer sessions and farm financial crisis subject-matter.

MONTANA

About a third of Montana's 23,570 farms and ranches carry debts exceeding 40 percent of their assets. In the past 2 years, Montana Extension staff have worked intensively with over 3,600 of the 5,400 farmers and ranchers considered to be in severe financial trouble. Of those helped, perhaps 89 percent will be able to continue farming full-time. Nearly 3 percent will leave farming, and 26 percent have or will get off-farm work to supplement farm income.

Extension efforts have involved: farm management workshops emphasizing financial management and forward planning; financial management workshops stressing financial management and debt restructuring, consulting one-on-one with individual families; and training of staff in other institutions, such as mental health centers, banks, and schools to enable them to counsel distressed farm families.

Extension's intensive training since October 1983 for agricultural lenders, consultants, vocational agricultural teachers, and others has enabled roughly 500 individuals to work with nearly 2,300 farm families. They will work with an estimated 1,800 more families within the next year. In one case, a county agent and a farm management specialist worked with a struggling young dairyman who faced nine major creditors, and enabled him to restructure his debt and save his operation.

MAINE

All 16 counties in Maine are involved in giving intensive help to farmers and communities in 1985. Maine estimated that 1,005 farm families now have severe financial problems and a strong need for assistance. Extension has provided that kind of help to 206 families in the past 2 years. During the same period, Extension trained agricultural lenders, consultants, and other professionals to better assist farm families. It is estimated that those who received this intensive training have helped some 938 additional farm families.

Intensive educational efforts include visits and consultations with families either on their farms or in the Extension office; individual financial assistance by telephone discussion of problems; organized problem-solving sessions with farmers in small groups; a 10-part correspondence course on farm tax management; and a consultant/task force method where the consultant on invitation visits a farm family, with Extension follow-up by appropriate individuals and/or groups. Often Maine farm families suggest that Extension's main contribution, besides technical assistance, is helping the family keep up their courage and deal with day-to-day stresses.

Extension financial management education focused on the dairy sector in 1984. About 45 percent of the state's dairy producers attended three area information meetings, and a new Maine Dairy Crisis Management program was established. Looking ahead to 1986, Maine Extension plans an increased use

of microcomputer software; more efforts for non-farm small businesses; more educational publications; and a more intense effort in marketing, management, and control of internal costs.

VERMONT

Financial problems and pressures, particularly in the dairy economy, have resulted in an estimated 1,000 Vermont farm families suffering severe financial stress during the past 2 years. Of this number, Extension has provided intensive help to 205 families, assisting 100 of the families with major stress problems. Of the total group, 112 farms will probably continue farming on a full-time basis, 40 will combine some off-farm work, and 30 will make the transition out of farming. On-farm counseling, workshops, and computer programs provide direct help to farmers; mass media (newsletters, radio, newspapers) are filled with general financial items, and classes are conducted with Farmers Home Administration (FmHA) participation. Where volunteers have become involved, they have included the legal community, and all this activity is expected to increase in 1986.

With the farm business complexities of the 1980's, Extension farm managers at the county level used a team concept in Vermont to assist many farm families. The team included Extension professionals, usually a FmHA representative, and various local business owners. Although often overlooked, the need for legal counsel is critical to develop wise business decisions in the farm operation and market. Extension surveyed farmers about how they use legal services and their priority of legal problems. Involved attorneys have agreed to work through the Extension agent to help individuals define legal problems. A legal education series for farmers in early 1986 will focus on estate planning and lease/credit contracts.

Financial stress on many family dairy operations also brings on personal stress. The Extension home economist in Addison County conducted a mail survey in June 1985, with follow-up contact to develop a support group. The newly formed Farmers Support Network is a group of trained local volunteers who can provide a resource of support and reassurance for farm women. In the future with a much expanded group, professional resources will be employed to introduce concepts regarding strengthening inter-personal relationships and the management of the farm business.

EXTENSION SERVICE, USDA

At the federal level, Extension Service, USDA, continues in its national leadership role through development and funding of several regional and national workshops, projects, and programs. Several of these are:

. Eighteen Intensive Efforts -- FY 1985 appropriations of $1 million funded 18 intensive efforts involving 22 State Extension Services to implement changes for improving the present situation of financially distressed farmers. Key factors in state project selection were number of farmers targeted and magnitude of the farm crisis. Projects include cooperative involvement of FmHA and other agriculture lenders, financial

management workshops, one-on-one counseling to prepare revised financial plans, local community involvement and support, computer decisionmaking packages, counseling centers and hotlines, multi-media education and awareness, and evaluation of program impact and changes made by farm families.

. North Central Region Stress Management Project -- Extension family life specialists are actively involved with farm families in developing teaching modules to answer needs in stress management which these families identified in a recent survey. Extension Service-USDA, is funding this special needs project in 5 states -- Iowa, Michigan, Minnesota, Missouri, and Nebraska -- with a $50,000 grant. Educational materials, including videotapes, slides, and teaching aides have been tested with farm families and are being made available for sharing with other states in the region and Nation.

. Additional Special Projects -- Other special projects funded by Extension Service, USDA, include: North Dakota--training financial management consultants; Nebraska--to assist the "Managing for Tomorrow" program; Minnesota--to establish the Farm Financial Management Center, and Texas--to assist financially distressed farm families.

. High-Tech Financial Assistance -- Working with the University of Nebraska and a range of technological experts, Extension Service, USDA, funded a special project involving interactive video disc technology connected with microcomputers in order to create an "interactive video" program on financial management for farmers. The program will instruct producers--through text, sound and video--how to construct a cash-flow projection for their own individual farm for use with lenders in applying for loans. Farmers will be able to use the program alone and tailor it to their own personal needs.

. National Workshop on Response to the Farm Crisis -- In cooperation with the University of Missouri, Extension Service, USDA, sponsored a national workshop in October 1985 for 100 farm management specialists from 44 states across the country. The workshop focused on sharing ideas, programs, and methods for dealing more effectively with the Nation's financially distressed farm families in the months ahead.

. Regional Sharing of Ideas and Resource Materials--Family resource management specialists in 11 midwestern states have formed an information network to share ideas and materials aimed at helping farm families in distress. This linking of programming efforts has reduced duplication of efforts and strengthened capacity to quickly meet the needs of farm families.

. FmHA and FCIC Cooperative Efforts -- Cooperative efforts with FmHA and FCIC have been carried out to strengthen and expand programs for assisting farmers with financial problems. Memorandums of understanding with these agencies were implemented to facilitate operation of cooperative programs. During the 1985 winter and spring period, Extension personnel across the

country assisted farmers in preparing cash flow projections and in preparation of FmHA loan applications. Extension also conducted training programs for FmHA personnel at the national and state levels. Assisting producers to understand and utilize risk management strategies has been the focus of a number of special projects jointly conducted by Extension and FCIC. These special projects gave particular attention to the possible use of crop insurance to provide protection for a farmer's minimum cash flow needs, and for protection against catastrophic financial losses.

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EXPANDED FOOD AND NUTRITION EDUCATION PROGRAM

Mr. WHITTEN. You are again proposing to eliminate EFNEP. Please provide for the record the impact elimination of this program will have regarding the number of jobs lost, volunteer services lost, the loss to the economy, and the number of families served.

Dr. GREENWOOD. It is unknown how much of the EFNEP would be lost. Some may be picked up by the States. Assuming that the States will not be able to pick up this program, those losing their jobs because of no Federal funding of EFNEP would include over 500 professional staff and 4,185 paraprofessionals. In addition, the Cooperative Extension System could lose the services of approximately 50 thousand trained EFNEP volunteers.

In a year, EFNEP serves approximately 225,000 young, low-income homemakers with your children. As they complete or graduate from the program, they are constantly replaced with others needing the same kind of training. Over the life of EFNEP more than 2.5 million families—representing approximately 10 million family members—have been trained in the basics of nutrition, food procurement, food preparation, food preservation, and food safety. It has been shown that this training will stay with them and produce better and healthier citizens for the rest of their lives.

The total loss to the economy of closing the EFNEP is difficult to estimate. The direct loss would be the $57 million of Federal funding and the approximately $9 million of State and local funding and in-kind donation of services and facilities.

Mr. WHITTEN. What percent of the total EFNEP funding is devoted to families receiving food stamps? What percent is devoted to persons receiving benefits through the WIC program?

Dr. GREENWOOD. Currently 66 percent of the EFNEP participants receive Food Stamps and 35 percent are in the WIC program.

Mr. WHITTEN. Please provide for the record an estimate of the health care cost avoided by families and individuals participating in this program.

Dr. GREENWOOD. We have never done any controlled studies to determine the savings in health care costs due to EFNEP. We feel it is sufficient, however, and our best estimate is that it saves one out of every four health care dollars over the life of an individual, plus the value of improved quality of life and increased personal effectiveness.

URBAN GARDENING

Mr. WHITTEN. Please provide for the record a table showing the location of the present programs, the number of participants, the number of volunteers assisting in the program, and the value of the food produced through the program compared to the Extension Service funds expended.

[The information follows:]

City	Volunteers	Participants	Estimated value	Funds expended
New York, NY	500	33,752	$1,863,975	$500,000
Chicago, IL	126	2,531	275,000	300,000
Los Angeles, CA	83	15,175	2,893,414	250,000
Philadelphia, PA	928	82,996	2,238,712	150,000
Detroit, MI	40	1,145	172,298	150,000
Houston, TX	73	2,793	850,000	150,000
Atlanta, GA	36	14,331	498,223	150,000
Baltimore, MD	91	6,000	723,630	150,000
Boston, MA	12	9,700	2,250,000	150,000
Cleveland, OH	358	17,225	1,907,080	150,000
Jacksonville, FL	80	5,543	1,330,320	150,000
Memphis, TN	97	3,192	1,408,077	150,000
Milwaukee, WI	109	5,639	647,000	150,000
Newark, NJ	134	3,200	461,268	150,000
New Orleans, LA	46	1,201	151,326	150,000
St. Louis, MO	102	2,530	271,866	150,000
Indianapolis, IN	2	891	1,660	112,500
Phoenix, AZ	14	426	27,690	112,500
Seattle, WA	16	300	2,205	100,000
Denver, CO	200	12,000	2,455,389	100,000
Bridgeport, CT	24	1,707	135,500	75,000

Mr. WHITTEN. Were any new cities added to the program in fiscal year 1985? If so, please identify. Do you have plans to extend the program in fiscal year 1986? If so, please describe the expansion plans.

Dr. GREENWOOD. There were five new cities that were added to the urban gardening program in fiscal year 1985. These were Phoenix, Arizona; Denver, Colorado; Bridgeport, Connecticut; Indianapolis, Indiana; and Seattle, Washington. Funds at the $3.5 million level are presently allocated to the 21 cities. There are no plans to expand the program beyond its present scope.

Mr. WHITTEN. Were any non-USDA funds received for this program in fiscal year 1985? If so, please provide the amounts and the sources of such funding.

Dr. GREENWOOD. The total amount of non-USDA funds received for this program was $1.024 million. Sources from which funds were received were city governments, private industry, private corporations and foundations, and in-kind services from municipalities and other agencies.

Mr. WHITTEN. What percentage of participants in the program are minority, low-income, and elderly?

Dr. GREENWOOD. Of the total 227,777 participants approximately 85 percent are low-incomes; 45 percent are elderly; and about 70 percent are minority.

Mr. WHITTEN. How many acres are under cultivation in this program?

Dr. GREENWOOD. There are 726 acres of crops under cultivation excluding walkways and paths.

4-H ENROLLMENTS

Mr. WHITTEN. Is the 4-H Club enrollment still on a downward trend? Please provide a five-year table showing enrollment by urban and rural areas.

Dr. GREENWOOD. 4-H enrollment has continued to decline and currently reaches approximately 9.3% of the youth population from 9-19. 4-H is showing an increase in the age group of under 9

years of age which is currently 782,497. The under 9 age group would be in addition to the 9–19 percentage above.

The other significant factors account for this trend. First, there has been a decline in professional staff time spent working with Extension youth programs from a high of 5410 FTE in 1974, to the current level of 4404 FTE in 1985. There appears to be a correlation between decline in youth and number of professional staff.

Second, the Extension professional has been more efficient in using volunteers for various tasks critical to developing a supportive environment for 4–H educational programs. Volunteers increased from 553,723 to 630,409 in 1984. The 1985 reports show the number of volunteers has made a difference in Extension being able to continue educational programming for a significant number of youth but, while the program is more efficient it is less effective in reaching larger numbers of participants.

[Additional information follows:]

Year	Rural [1]	Percent	Urban	Percent	Total
1981	2,691,078	53.87	2,304,589	46.13	4,995,667
1982	2,537,884	53.28	2,225,138	46.72	4,763,021
1983	2,534,006	54.40	2,123,778	45.60	4,657,784
1984	2,402,521	54.34	2,018,411	45.66	3,420,932
1985	2,328,120	53.67	2,009,338	46.33	4,337,458

[1] Rural is farms and towns under 10,000

Mr. WHITTEN. Is the change in enrollment comparable to the change in total population for this age group?

Dr. GREENWOOD. Calculations of the population in the 9–19 age group show a continuing decline in the potential for 4–H enrollment. That age group numbers 38,083,833. The increase in births which started in the late 1970's is expected to cause the age group of 9–19 to start increasing again. This may explain some of the recent increases in the 4–H enrollment in the under 9 age group. The decline in 4–H enrollment has tended to run parallel to the decline in the 4–H eligible population. In recent years, 4–H enrollment has been slightly more accelerated.

In the last 10 years, 4–H has reached a percentage range of 9.3% to 12.0% of the 9–19 population age group.

Mr. WHITTEN. Have you developed any special program to counter declining enrollment? If so, please describe them.

Dr. GREENWOOD. In 1972 to 1976, educational TV was used to educate youth as well as to attract youth to register in other educational 4–H programs. A new TV program, "Blue Sky Under My Feet," has been completed and the training of staff and distribution should be accomplished this summer. Subjects included are: Gravity, leverage and tools; fiber and clothing; and food, nutrition and fitness.

A national panel of key Extension administrators has just completed the 4–H Future Focus report. The report calls for expanding the already strong effort in leadership development of youth, adults and professionals staff to empower them for greater responsibilities; to strengthen and expand relationships to the total land-grant system so as to offer registration in a much broader educational curriculum; sharpen the focus of the program on emerging

needs of youth and to strengthen the public and private partnership.

Mr. WHITTEN. Has there been any change in enrollment in States in which agriculture is the dominant economic sector? If so, please explain for the record.

[The information follows:]

TOTAL 4-H ENROLLMENT, DUPLICATIONS ELIMINATED (SELECTED STATES)

	1982	1983	1984	1985
Alabama	115,869	116,583	105,121	105,070
Arkansas	61,881	53,713	47,121	62,094
California	94,438	85,393	73,834	[1] 73,834
Georgia	162,477	159,194	162,847	163,376
Illinois	128,496	142,735	124,537	144,150
Indiana	142,905	151,090	145,179	144,122
Iowa	89,678	94,421	83,117	87,702
Kentucky	235,465	235,089	227,330	220,800
Michigan	214,580	213,117	197,559	160,989
Minnesota	183,064	102,651	139,699	116,087
Mississippi	105,785	101,207	98,576	82,260
Missouri	110,404	92,432	97,194	101,868
New York	561,558	567,717	519,723	494,832
North Carolina	102,665	90,930	98,901	104,515
Ohio	167,059	181,216	163,408	142,733
Pennsylvania	96,353	84,473	86,611	76,219
Puerto Rico	37,305	33,150	37,164	34,362
South Carolina	65,689	60,736	53,464	48,540
Tennessee	177,641	175,345	173,023	170,911
Texas	187,067	193,184	165,002	203,585
Virgina	158,732	151,204	143,499	115,467
Wisconsin	108,863	111,736	119,985	127,307
Totals	3,307,974	3,197,316	3,062,894	2,980,823

[1] 1985 data not available.

Note.—Twelve of the 22 States show a slight decrease: 6 States show a slight increase, and 4 States indicate little change. Across the 22 States, the trend is in a downward direction dropping from 3.3 million 4-H participants in FY82 to 3.0 million in FY85. This is a decrease of 327,151 or approximately 10 percent.

Mr. WHITTEN. What impact would there be on this program if Extension Service is reduced as you are proposing?

Dr. GREENWOOD. There are three parts of the present proposal tht would impact 4-H. One is the language ". . . that extension agents may provide other services only after the needs of farm operators have been fully met." The second is the reduction of Smith-Lever formula funding by 47%. A third impact is the proposed elimination of the Expanded Food and Nutrition Program.

Limiting services to "farm operators" would likely have the greatest immediate impact as it would alter the nature of the Smith-Lever legislation. The current enrollment in 4-H is 4.3 million youth of which 700,000 live on farms. Assuming no other factors operate, the net effect would be a reduction of 3.6 million in 4-H youth participants and approximately 500,000 volunteers who provide instructional and supporting services.

A reduction of Smith-Lever funding by 47% would impact the number of paid staff working in the 4-H program. Currently, for every full-time equivalent professional staff member working in 4-H at the county and State levels, there are approximately 140 4-H volunteers and 1,000 4-H youth. The reduced funding when trans-

lated to FTE's of 4-H staff time amounts to about 880. Thus, the impact would be a reduction of 880,000 4-H youth and 123,200 4-H volunteers.

The elimination of the Expanded Food and Nutrition Program would discontinue service to 428,422 low-income youth.

RENEWABLE RESOURCES EXTENSION ACT

Mr. WHITTEN. Are there other sources of funds devoted to activities under the Renewable Resources Extension Act? If so, please identify the amounts and sources of those funds.

Dr. GREENWOOD. Last year we estimated that $28.6 million was devoted to renewable resources programs. $2.5 million of this total is from the Renewable Resources Extension Act appropriation and the balance was from Smith-Lever formula funds, State, county and private sources. The Smith-Lever portion accounts for approximately 30 percent.

Mr. WHITTEN. Are there opportunities under this program to assist financially stressed farmers by redirecting some of their production to production of timber and wood products? If so, please describe and if appropriate, provide examples of where and how this is being done.

Dr. GREENWOOD. The Renewable Resources Extension Act provides for educational programs that are assisting financially stressed farmers. A number of States are delivering educational programs to farmers stressing the sound economics of planting trees on marginal farmlands including highly erosive soils. Georgia, for example, has prepared a publication for use in their program that compares the economics of pine production to conventional crops such as corn and soybeans on marginal soils. This approach has been modeled and used by other States to help redirect farm production into forestry and wood products where appropriate.

In Mississippi a specific forestry Extension effort called "Farm Forestry Economics" has been developed. This program is designed to help farmers evaluate the impacts of amortization, investment credit and the forestry incentive program on their individual farm operations and rates of return on investments. The program is also structured to introduce farmers to forest crop alternatives and makes them aware of the increasing economic potential of wood fiber production. In addition, other income producing alternatives are addressed such as the management of land to produce income through the leasing of hunting rights and for other recreational pursuits. The 19-county pilot project in Texas helped farmers and ranchers improve their annual income by over $7 million through efforts on improved wildlife habitat management and marketing of access to hunting groups.

Forestry programs have also focused on helping farmers to understand and use Federal tax incentives relative to forest production. For example, in the State of Mississippi surveys in 1985 revealed that owners tax savings resulting from this education ranged from $200 to $20,000. Efforts in other States report similar results with improved owner understanding of the capital gains provision allowance for timber sales.

Price reporting and marketing information is also provided in many States to assist farmers in understanding how to sell their timber at fair market values. In Arkansas farmers and woodland owners averaged a 12% increase in income from timber sales as a result of marketing information supplied through Extension. Mississippi estimated that the income increased to landowners by these kinds of Extension programs was approximately $1.6 million.

Another example is the role that Extension played in developing a new forest industry in Morgan County, Tennessee which will provide additional markets for farm timber as well as jobs for distressed and displaced farmers and farm workers.

Mr. WHITTEN. In the explanatory notes reference is made to a 19 county pilot project in Texas to improve wildlife management and opening new opportunities to hunting and fishing, which has increased the income of those ranchers and farmers by $7 million. Is this type of activity transferrable to other parts of the country? If so, is the Extension Service making it available to other areas? How much initial investment was necessary to provide the improvements in this pilot project?

Dr. GREENWOOD. This program is indeed transferrable to other States and other parts of the country. In fact, a considerable number of States have implemented programs that are quite similar and they are having comparable impacts. In Louisiana, increased income to landowners as a result of habitat improvement and marketing programs is estimated at $4 million. The focus of these programs is to capitalize on the investments that landowners are already making or have made and managing and utilizing the total resource base rather than just one segment. Currently in Mississippi an Extension program in the northeastern part of the State is teaching landowners how to combine their ownerships and market access to generate income. To date 12 landowner "aggregates" have been formed. Many forest management practices that improve their production also can result in improved wildlife habitat.

PESTICIDE IMPACT ASSESSMENT

Mr. WHITTEN. Were any special projects conducted on the pesticide impact assessment program in fiscal year 1985? Are any being conducted in fiscal year 1986? If so, please describe them for the record.

Dr. GREENWOOD. The Extension Service and eight other U.S. Department of Agriculture agencies in cooperation with the Land Grant Universities and State Regulatory agencies—through the National Agricultural Pesticide Impact Assessment Program—NAPIAP—conducted special projects in both fiscal years 1985 and 1986. In fiscal year 1985, NAPIAP initiated project reviews on the pesticides acephate, alachlor, aldicarb, amitrole, daminozide, dicofol and metolachlor. In addition to this, assessment teams were established to conduct project reviews on all fumigants in six use areas of apiculture, regulatory quarantine, soils, stored grain, structures and tobacco.

In fiscal year 1986, a report was prepared on diazinon. Plans are underway to establish a chlordimeform review on cotton, as well as

preparing to respond to 20 other pesticides when the date of initiation is announced that the EPA has proposed for special review.

The Technical Advisory Group—TAG—of NAPIAP continues to review and prepare a Departmental response to the EPA on all proposed regulatory changes as mandated in the FIFRA.

Two joint projects between Extension Service, USDA and the University of Florida and University of Nebraska are part of a continuing series of pesticide assessment projects conducted through NAPIAP. These educational projects are respectively entitled "Legal Implications of Pesticide Use and Impact Assessment" and "Pesticide Impact on Human Health." They are examples of how the NAPIAP's scope has been expanded in response to new emerging concerns about pesticide use. In addition, each State Extension Service conducts special projects to establish a State pesticide benefit/use information data base for responding to proposed Federal and State regulatory changes. Examples include evaluation of product efficacy, pesticide information and storage retrieval systems, pesticide use surveys, pesticide assessments by commodity, pest profiles and pesticide exposure information.

Mr. WHITTEN. How are special projects selected?

Dr. GREENWOOD. The TAG of the NAPIAP recommends and establishes assessment teams to review and report on the benefits/use and risk of pesticides for agriculture and forestry production. The depth of study is based on available resources and EPA time frames established to register pesticides. The TAG also recommends data gaps to the States who in turn submit project proposals. These proposals are reviewed for data inquiry and recommended funding. They are returned to regional committees who make final decisions to implement data gap research. Major attention is given to those areas like groundwater and soil contamination, voluntary and involuntary exposure to pesticides, pesticide waste disposal, drift, endangered species, comparative efficacy, resistance, and soil chemistry/pesticide interaction.

The Extension Service, USDA provides national program leadership and development on certain joint cooperative projects with trend-setter States. These key educational projects address Federal environmental laws which frequently serve as a "template" for individual laws of each of the 50 States and three Territories. Specifically, the FIFRA serves as a basic minimum for State pesticide laws and regulations.

The individual State and Territorial Extension Services select special projects to develop, collate and retrieve pesticide benefit/use and risk information for use by regulatory agencies in establishing laws and regulations. They are then in a better position to inform the public on proper compliance with existing laws and regulations. These projects are based on previous requests for data as well as anticipated or expected new courses of action.

Mr. WHITTEN. Does EPA have any pesticide groups under review or targeted for review at the present time? Please describe in gen-

eral terms the impact of cancelling any of those under review or targeted for review.

Dr. GREENWOOD. Every registered pesticide is continuously under review. Some are selected for special review. According to the EPA's latest periodic list, Special Reviews have been issued on 20 chemicals and one has been identified for Pre-Special Review. The EPA has also requested data call-in on pesticides which are categorized in six clusters, and special data call-in on pesticides in 54 different groups. In another listing, the EPA has identified proposed action and time frames during FY 1986 on 22 chemicals.

The USDA calculated the potential adverse agricultural economic impact on cancellation of the first 21 pesticides or groups of pesticides under review in the EPA's Special Review process is estimated at over $6 billion annually. No recent estimates have been made on pesticides subject to the EPA Special Review because the list keeps changing. As past history indicates, we would expect the cost would be of similar magnitude. More importantly, all the major fungicides are being targeted as subject to special review. Should they be cancelled, there would be little chemical control available for agricultural use. The same situation holds forth for the fumigants since the cancellation of EDB. Chemical control for soil fumigants, stored products, apiculture, tobacco, and structural pest control would be practically nil.

Mr. WHITTEN. What will be the impact of terminating this program?

Dr. GREENWOOD. The impact would be that data and information from Extension Service's field work and result demonstrations would not be available. Also, accurate and scientific technical data for defining and evaluating risks of selected pesticides having critical agricultural and forestry uses in registering pesticides would be greatly reduced. This will force the EPA to rely on existing information rather than also including current grass-roots benefit-use data from current and ongoing agricultural field operations. The connecting link of the Extension Service between the farmer and the government for inputs to registering pesticide would not exist.

HOME ECONOMICS

Mr. WHITTEN. How much of the fiscal year 1986 and 1986 Smith-Lever funds were devoted to home economics? How much of the fiscal year 1987 request would be devoted to home economics?

[The information follows:]

Fiscal year:	
1985	[1] $76,308,000
1986	[1] 72,817,998
1987	[2]

[1] Estimated.
[2] To be determined.

FARM SAFETY

Mr. WHITTEN. Please provide a table showing the number of deaths and disabling injuries due to farm accidents over the past five years.

[The information follows:]

AGRICULTURAL WORK ACCIDENTS

Year	Fatalities	Disabling injuries
1980	2,000	200,000
1981	1,900	200,000
1982	1,800	180,000
1983	1,800	180,000
1984	1,600	170,000

Mr. WHITTEN. What is the economic impact of that level of deaths and disabling injuries? How does this compare with the $1 million Extension Service spends on farm safety programs?

[The information follows:]

Costs of all injury and death accidents to farm families for one year as reported by the National Safety Council are as follows:

Motor vehicle and farm related	$1,734,000,000
Work accidents less motor vehicle	1,885,000,000
Home accidents on farmsteads	324,000,000
Public accidents for farm residents	975,000,000
Farm accidents to non-resident (work)	2,030,000,000

These costs include only direct economic loss. Indirect loss would include wages lost, medical administration of insurance, etc. Work accidents are twice as costly as motor vehicle accidents.

Mr. WHITTEN. Please provide a table showing, by major industry group, the level of deaths and disabling injuries over the past five years.

[The information follows:]

Year	Mining	Construction	Manufacturing
1980:			
Fatals	500	2,500	1,600
Injury	40,000	240,000	450,000
1981:			
Fatals	600	2,200	1,400
Injury	50,000	210,000	400,000
1982:			
Fatals	600	2,100	1,000
Injury	50,000	200,000	290,000
1983:			
Fatals	500	2,000	1,200
Injury	40,000	200,000	333,000
1984:			
Fatals	600	2,200	1,100
Injury	50,000	220,000	300,000

	Employees
Mining	1,000,000
Construction	5,500,000
Manufacturing	20,000,000
Agriculture	3,400,000

RURAL DEVELOPMENT CENTERS

Mr. WHITTEN. Please describe for the record some of the major accomplishments of the Rural Development Centers during fiscal year 1985.

[The information follows:]

Southern Rural Development Center, took the lead in a national project with the

other centers to prepare and distribute program materials in small business management. Over 650 copies of the materials were distributed to every land-grant university. To date, twenty States are providing rural merchants with business management training. Other major efforts included:

Interdependencies of Agriculture and Rural Communities.

Water Quality: agriculture and community concerns.

Microcomputers for local government.

Impact of agriculture districts on the retention of agricultural land and property tax distribution.

The economic analysis of alternative trash collection methods for rural towns and cities.

Analysis of employment changes in the rural south and their economic and educational implications.

North Central Rural Development Center, supported a program in the "Retention and Expansion of Existing Business". Ohio has been the lead on what is now a national Extension effort to assist local businesses resolve problems. Some 28 Extension programs are active and 51% of the programs serve communities under 25,000 population. Most programs work closely with the State Development Offices. Other major efforts include:

Downtown revitalization.

Community energy (efficiency models, audit and projections).

Community services and facilities.

Interdependencies of agriculture and rural communities in the Twenty-first century.

Northeast Rural Development Center, has been active in the natural resource area of "groundwater". In support of Extension's interest in training county agents to become more involved in toxic substance and hazardous waste issues, program materials have been developed, workshops held, a bibliographay published and work on computerizing a data base begun. Other programs include:

Local government finances.

Community economic development.

Local leadership development.

Western Rural Development Center, has been actively working on programs to assist those communities adversely affected by the loss of jobs in the natural resources based industries—forestry, fishing, agriculture, and minerals. Workshops and stagnation, slow decline and rapid decline. As a result, communities in New Mexico, California, Idaho, Montana, Oregon, and Washington State have active programs. Other efforts include:

Citizen involvement in energy development issues.

Public service efficiencies and public support.

Family community leadership.

Mr. WHITTEN. What are the funding levels for the Rural Development Centers for fiscal years 1985 and 1986, and how many staff years are allocated to each?

[The information follows:]

In addition to Extension funds, the four Regional Rural Development Centers, receive funds from the Cooperative State Research Service (CSRS/USDA), private foundations and in one case (North Central) the States in the region. The level of Extension funding has been the same for all centers.

In FY85 the Extension level was $125,000 per Center.

In FY86 the Extension level was $172,000 per Center.

All projections are conducted through the contributed time of the State Extension faculty involved. The contributed time is considerable, more than doubling the Federal partner contribution. Each host State institution also contributes to the support of the Center Director. The Centers' approved plans of work support a minimal staff. For each Center the Extension funding for full time equivalency (FTE) for the Center Director, secretarial support, and editorial assistance is:

Southern Center, 2.7 FTEs.

Northeastern Center, 1 FTE.

North Central Center, 1.5 FTEs.

Western Center, 2.36 FTEs.

INTEGRATED PEST MANAGEMENT

Mr. WHITTEN. In general terms, please describe what has been accomplished to date under this program. Cite some specific examples for the record.

Dr. GREENWOOD. The Integrated Pest Management—IPM—program was initiated as pilot projects in the early 1970's and was expanded to ongoing program status in all States by 1979. The program has focused on crop-pest problems which can be addressed with solutions that are economically and environmentally sound. The IPM program has been a factor in helping Extension, farmers, and the agribusiness community move toward the systems approach in agricultural education.

The IPM program has provided well-documented results supporting the restoration of agricultural profitability. The substitution of good management practices for capital expenditures is one of the few ways individual farmers can cope with current economic conditions, and the IPM program helps to give farmers those good management tools. Our 1985 reports from State IPM programs document substantial reductions in farmers' pesticide costs.

[Additional information follows:]

PESTICIDE COSTS REDUCTIONS ATTRIBUTED TO IPM PROGRAM—1985 (HISTORICAL AND USER/NON-USER)

State	Crop	Reduction
Alabama	Pecans	$3.1 million.
Arkansas	Soybeans	$230,000.
Arkansas	Cotton	$250,000.
Arizona	Cotton	$40/acre.
Connecticut	Apples and sweet corn	$10,430.
Delaware	Corn	$32,500.
Idaho	Alfalfa seed	$270,000.
Illinois	Corn	$6 million.
Kansas	Corn	$8.25 million.
Kentucky	Corn	$650,000.
Louisiana	Soybeans	$4.5 million.
Louisiana	Cotton	$17.1 million.
Maryland	Tomatoes	$120,000.
Maine	Potatoes	$464,000.
Mississippi	Cotton	$15 million.
Mississippi	Soybeans	$3.7 million.
North Carolina	Cotton	$2.3 million.
North Dakota	Sugarbeets	$305,700.
New Hampshire	Sweet corn	$9,900.
New Jersey	Snap and lima beans	$380,000.
New Jersey	Apples	$420–25/acre.
New Mexico	Range	$61,000.
New York	Apples	$144,000.
Oklahoma	Cotton	$13,000.
Oklahoma	Alfalfa	$40,000.
Oklahoma	Stored grain	$20,000.
Oregon	Filberts	$69,000.
South Carolina	Cotton	$2.4 million.
Texas	Pecans	$64/acre.
Texas	Cotton (Rio Grande valley)	$17/acre.
Texas	Cotton (coastal plain)	$3/acre.
Virginia	Small grain	$196,000.
Virginia	Peanuts	$5.9 million.
Washington	Hops	$25/acre.

PESTICIDE COSTS REDUCTIONS ATTRIBUTED TO IPM PROGRAM—1985 (HISTORICAL AND USER/NON-USER)—Continued

State	Crop	Reduction
Wisconsin	Cabbage	$40/acre.
Wisconsin	Field corn	$10/acre.
West Virginia	Tree fruit	$14–21/acre.

PEST-RELATED LOSSES AVOIDED

State	Crops	Losses avoided
Alabama	Soybeans	Stem canker reduced to 0.5%.
Florida	Potatoes	$534,000 wireworm damage.
Georiga	Cotton	222,593 acres monitored for pests.
Illinois	Soybeans	637,500 bushels from nematodes.
Illinois	Soybeans	13.5 million bushels from diseases.
Iowa	Corn	$8 million from black cutworm.
Kansas	Stored grain	50,000 bushels.
Louisiana	Cotton	45,000 bales from nematodes.
Maine	Potatoes	$5 million from late blight.
Minnesota	Corn	$4 million from European corn borer.
Mississippi	Cotton	200,000 bales from insects.
Mississippis	Soybeans	$818,670 from cyst nematodes.
North Carolina	Cotton	$2.7 million from insects
Nebraska	Crops and Livestock	$1.7 million costs saved.
New Hampshire	Apples	Insect and disease damage reduced 33%.
Oklahoma	Stored grain	50,000 bushels.
Oklahoma	Cotton	$20/acre.
South Carolina	Cotton	$3.1 million from insects other than boll weevil.
South Dakota	Field crops	Herbicide injury reduced 69%.
Texas	Peanuts	384 pounds/acre.
Virginia	Peanuts	$230,000 from diseases.
Washington	Asparagus	20% less rust.
Wyoming	Alfalfa	.7 ton/acre.

VOLUNTEERS

Mr. WHITTEN. The Extension Service makes extensive use of volunteers. What impact will your budget proposal have on a program so dependent upon volunteer assistance?

Dr. GREENWOOD. The President's budget proposes a 60% reduction with the remaining sums to be focused on the needs of farmers and their families. It is not known exactly how this reduction plus the focusing of the remaining funds would impact directly on the number of volunteers involved with Extension. It appears likely that such a cut would result in a reduction in the number of agents. Overall it is estimated that almost 6,000 days of volunteer time would be lost for each agent lost. However, since some program areas work more with volunteers than do others and since the language focuses more on the needs of farmers and their families, it seems likely that some program areas would experience larger reductions than others.

Mr. WHITTEN. How many people volunteered their time and service to the Extension Service last year?

Dr. GREENWOOD. The most recent comprehensive national figures indicate that in 1983, 2.9 million people worked with the Cooperative Extension Service as volunteers contributing more than 71 million days of their time on Extension related activities—the value of their contributed time is 4.5 billion dollars. These volunteers worked with 48 million other adults and youth.

Mr. WHITTEN. What is the cost associated with the use of these volunteers?

Dr. GREENWOOD. A typical Extension agent spends about one-third of their time recruiting, training, and working with volunteers. For every day an Extension professional spent on such activities, volunteers invested about 51 days of their own time. While public funds are used to support the cost of agent time they are not used to compensate Extension volunteers for their costs, such as meals, travel, uniforms, clothing or liabilities—often these costs will be part of a volunteer's contribution. At other times such costs may be deferred through the use of funds made available by private sources such as local groups or organizations.

REIMBURSEMENTS

Mr. WHITTEN. In the explanatory notes you have a listing of reimbursements received from other Federal agencies and non-Federal sources. Please provide a listing of these projects and describe for the Committee what the project is, where the project is carried out, how the funding is used, anticipated length of the project, and what effort the Extension Service provides in this area.

[The information follows:]

REIMBURSEMENT FROM OTHER FEDERAL AGENCIES AND NON-FEDERAL SOURCES

PROJECT DESCRIPTION	LOCATION(S)	USE OF FUNDS	TERMINATION DATE	EFFORT BY ES
ASCS- Rural Clean Water-Technical Assistance to the States	21 Locations	Salaries, support costs, materials	FY 1986	Technical assistance, information and educational projects
ARS- Support Services	Washington, D.C.	Salaries, support costs	FY 1986	Provide moving services to ARS staff
Evaluation Study-Improved Profitability	To be Determined	Salaries, support costs, materials	FY 1986	Conduct a study on Extension's efforts to improve profitability of farms through integrated production, financial and marketing programs
APHIS-International Youth Conference	Washington, D.C.	Salaries support costs, materials	FY 1986	Provide leadership and coordination by chairing the Executive, Planning and Operations Committees
CSRS- Aquaculture	Washington, D.C.	Salaries, support costs	FY 1986	Provide program leadership for the aquaculture program
ERS- International Youth Conference	Washington, D.C.	Salaries, support costs, materials	FY 1986	Provide leadership and coordination by chairing the Executive, Planning and Operations Committees
FCIC- Crop Insurance Workshops & Training	4 States Others to be Determined	Travel, related costs	FY 1986	Develop and conduct educational programs related to crop insurance
FAS- World Information Service	Nationwide	Usage costs of computer time	FY 1986	Data Information Service

PROJECT DESCRIPTION	LOCATION(S)	USE OF FUNDS	TERMINATION DATE	EFFORT BY ES
AID- PASA Technical Assistance to Developing Countries	10 Countries and the U.S.	Salaries, support costs	FY 1986	Provide expertise on extension type programs, training, materials, and publications
DOI- Fish and Wildlife	Nationwide	Costs of recognition materials and travel expenses	FY 1986	Liaison between Fish and Wildlife Service and 4-H programs
EPA- Pesticide Application Training	Nationwide	Support training activities	FY 1987	Develop and administer training programs for State certification of pesticide applicators
NON-FEDERAL SOURCES				
Federal Building Fund- Federal Assistance Program Retrieval System- Federal Telecommunications- Cost Share Printing-	Various States	Provide for Administrative Support of CES programs	FY 1986	Provide office space, telecommunications, property and equipment for use by State Extension Services. Portion of States costs for publication and distribution of ES materials

RURAL CLEAN WATER PROGRAM

Mr. WHITTEN. Has your budget proposal had any effect on the projects funded under the rural clean water program in the past? How many projects have you added in fiscal year 1986? Please describe for the record each of the projects funded under the rural clean water program and project your estimated termination date.

Dr. GREENWOOD. We are not able to project whether our budget proposal will have specific effects on Rural Clean Water Program (RCWP) projects. This depends largely upon how the State Directors of Cooperative Extension allocate the resources available to them under the proposed budget. Specific effects, if any, are likely to be reflected in staffing at the State and county levels. Rural Clean Water Program projects are not likely to bear disproportionate changes in such staffing.

We have not added any new RCWP projects in 1986. Such projects are administered on a multi-agency basis, and the strategy doesn't include any new projects. There has been some re-direction, however, the Cooperative Extension components in two projects—Pennsylvania and Vermont were expanded in the past few months.

[A Brief Description of each Project and Estimated Termination Date follows:]

1. Alabama—Lake Tholocco RCWP project: The propose of the project was to improve the water quality in the lake by reducing animal waste and agricultural chemicals and sediment that was entering the lake. Estimated termination date for funding 1986, and for mnitoring 1995.

2. Delaware—Appoquinmink RCWP project: The major water quality problems in this 31,000 acre river basin were the extremely high concentrations of nutrients (nitrogen and phosphorus), sedimentation due to loss of cropland, pollution caused by animal waste and suspected chemical runoff from agricultural sources. Funding is already terminated, however monitoring will continue until 1995.

3. Florida—Taylor Creek-Nubbin Slough RCWP project: The principal water quality problem in this project is nutrient enrichment most notably phosphate, from intensive agricultural operations, and concentrated dairy farming and beef cattle operations along Taylor Creek-Nubbin Slough watershed. This contributes to eutrophication of Lake Okeechobee. Funding will end in 1988, and monitoring will end in 1995.

4. Idaho—Rock Creek RCWP project: The objective of this project is to meet State water quality standards for nitrogen, phosphorus, bacteria and agricultural chemicals in Rock Creek and Snake River. Funding ended in 1985; monitoring of water quality will end in 1995.

5. Illinois—Highland Silver Lake RCWP project: The Highland Silver Lake, a 600 acre lake is used as a source of public water supply and for non-contact recreation. Excessive amounts of pollutants are found within the lake. Severe erosion and runoff from croplands are the primary sources for these pollutants. Project funding has been terminated but monitoring will continue until 1995.

6. Iowa—Prairie Rose Lake RCWP project: The major non-point source water problems are sedimentation, turbidity, and agriculture chemicals. The lake is used for body contact recreation, wildlife, warm water aquatic life, and raw water source for a potable water supply. Funding was terminated in 1985. Monitoring will continue until 1995.

7. Kansas—Upper Wakarusa RCWP project: Soil erosion and deposition in ponds and stream channels is a problem in untreated cropland fields. Funding was terminated in 1984. Monitoring will continue until 1995.

8. Louisiana—Bonne Idee RCWP project: The major water quality problems are sediments; organochloride insecticides in water; nutrients (nitrogen and phosphorus resulting in eutrophic water bodies; toxic substances—pesticides and herbicides). Funding should end about 1992 and monitoring is scheduled to continue until 1995.

9. Maryland—Double Pipe Creek RCWP project: The major source of nonpoint sources pollution in this project area are animal waste and sediment loads. Other pollutants are nutrients, oxygen demanding materials, and toxic materials. Funding should end about 1990 and monitoring 1995.

10. Massachusetts—Westport River RCWP project: The major sources of nonpoint source pollution are erosion and sedimentation from cultivated fields, polluted runoff water from dairy feedlots and loafing areas, and fertilizer and pesticide use. Funding terminates in 1986. Monitoring continues until 1995.

11. Michigan—Saline Valley RCWP project: The major sources of nonpoint source pollution in this project are from increased levels of dissolved solids, bacteria, sediments, nutrients, and pesticides in rivers and lakes. Funding for this project has been terminated. The monitoring activities will continue through 1995.

12. Minnesota—Garvin Brook RCWP project: Water quality problems from nonpoint agricultural sources include ground water contamination, pesticides, nutrients, and sediment from critically eroding areas. Funding will terminate in 1986. Monitoring will continue until 1995.

13. Nebraska—Long Pine Creek RCWP project: The water quality in this project area is being adversely affected by pesticides, nutrient (nitrogen and phosphorus), animal waste, sewage and sedimentation. Groundwater contamination is an additional concern. Termination dates for funding 1990, for monitoring 1995.

14. Oregon—Tillamook Bay RCWP project: The primary water quality problem is caused by fecal contamination from fairy operations. Shellfish harvesting has been closed down periodically during periods of high fecal contamination, and health hazards exist in the tributaries where water contact activities are popular. Funding terminates in 1987, monitoring continues until 1995.

15. Pennsylvania—Conestoga Headwaters RCWP project: Sources of nonpoint pollution in this project area: chemical pollutants (nitrogen and phosphorus) from agricultural fertilizers, suspended solids and turbidity, pesticides, and disease producing organisms. Termination dates: for funding 1990; for monitoring 1995.

16. South Dakota—Oakwood Lake Poinsett RCWP project: Both surface and groundwater quality are sources of concern in this project. Nitrate concentrations in domestic water supplies have been cited within the project areas as exceeding drinking water standards. Other pollutants are chemical pesticides. Funding will terminate about 1990. Monitoring is scheduled until 1995.

17. Tennessee-Kentucky—Reelfoot Lake RCWP project: The primary water quality problem in this project area is the accelerated silt-in and eutrophication of the lake. Funding for the Extension aspects of the project has terminated. Monitoring is scheduled to continue until 1995.

18. Utah—Snake Creek RCWP project: The primary source of water quality problems in this project area is animal waste disposal. Funding for this project has been terminated. Monitoring is scheduled to continue until 1995.

19. Vermont—St. Albans Bay RCWP project: The water quality problem in this project area is caused primarily by animal waste from dairy farms contaminating the St. Albans Bay. Funding is scheduled to terminate in 1988, and monitoring goes on until 1995.

20. Virginia—Nansemond—Chuckatuck RCWP project: The primary sources of pollution in this project area is caused by animal waste sedimentation, and excess nutrients. Funding will terminate about 1990 and monitoring will continue until 1995.

21. Wisconsin—Lower Manitowoc RCWP project: Water quality problems in this project area include: excessive quantities of phosphorus, high bacterial levels and sedimentation in the harbor. Funding will terminate about 1988, and monitoring will continue until 1995.

Mr. WHITTEN. I would yield at this time to Mrs. Smith.

NUTRITION PROGRAMS

Mrs. SMITH. Thank you, Mr. Chairman.

Welcome, Dr. Greenwood; welcome back, Dr. Bentley, and all of you.

I note that the budget proposal would reduce funds for the Federal Extension Service to the enhancement of farm profitability. You know, in my State of Nebraska the Home Economics Program is very important from the standpoint of wellness and nutrition. We think it is a very important part of profitability.

Would these programs continue to be available under your budget proposal?

Dr. GREENWOOD. The budget proposal would target, initially, farm operators as the recipients of educational assistance. It would seem to me, however, without question programs dealing with today's farm profitability must address the total family—the homemaker as well as youth in that family—and also reach community leaders and organizations.

The budget proposal would indicate that the needs of farm operators would have to be met first and then other segments of the population would be served.

Mrs. SMITH. Following up on what you just said about profitability including the family and the community, I know that the Extension Service works very well with several educational components of which agriculture is just one. So I am wondering about separating these components and saying, this is available to some but not to others, like to the farmer's child but not to the child in the small town.

Dr. GREENWOOD. I think this is a very relevant question and one which I would hope this Committee and others would address because one of the strengths of the Extension system has been working with the total family and the total community with regard to these existing issues.

FARM FINANCIAL MANAGEMENT

Mrs. SMITH. Now, what could we expect under this budget to happen to the $1.4 million that we funded by a special congressional appropriation to help the financially distressed farmers and ranchers in 1986?

Dr. GREENWOOD. The funds that were appropriated in 1986 have been allocated to the states.

Mrs. SMITH. But would we have more funds under this budget in 1987?

Dr. GREENWOOD. No, this has not been included in the 1987 proposal.

Mrs. SMITH. Well, that is my understanding. It concerns me a great deal because this is one of the areas that is most important and, I think, doing some of the greatest good in our area.

Dr. GREENWOOD. It would be anticipated that some of the formula funds would be used for this purpose because it is an important issue and one which our System is capable and must address.

Mrs. SMITH. I will have some questions, too, for the record, Mr. Chairman, but there is just one more I would like to ask now.

TRANSFERRING RESEARCH KNOWLEDGE

Dr. Bentley, the ARS has a small increase in funding which we very much support and are glad, but it concerns me that then we turn around and talk of reducing the Extension Service by 59 percent when, as you pointed out, Dr. Greenwood, you transfer the fine knowledge that we get in ARS; and I think that this transferring of the knowledge is a key if we are going to really make use of it.

Any comment?

Dr. BENTLEY. Yes. This gets into questions that have to do with priorities that govern in development of the overall budget. One of

the statements that has been made by OMB Director Miller is to the effect that the research and technology aspects would be given a high priority because of their importance to the competitive position of industry and international competition and so forth, and that policy was followed as they developed the budget and submitted it to the President.

In addition, there were some areas that were designated for increased attention in the ARS budget having to do with new crops and new uses, that had contributed some to the increase in funds for ARS.

Mrs. SMITH. Let me just say to you folks in closing that I will always be a friend of the Extension Service. I made my first speech when I was a county 4H club president standing on the back of a truck and my father said my legs shook so hard that the whole truck shook; but all through our lives, in our farming operation, in raising poultry, in raising certified seed potatoes, in our community the Extension Service has been a real key to what we have done in our lives and we are very grateful.

Thank you.

Mr. WHITTEN. Mr. Traxler?

Mr. TRAXLER. Mr. Chairman, I will yield to Mr. Natcher at this time.

Mr. NATCHER. Thank you, Mr. Traxler. Thank you, Mr. Chairman.

Mr. Chairman, one of the nicest things that has happened to me since I have been a Member of Congress is the opportunity that I have had to serve with you and our other colleagues on this Subcommittee. I have been on this Committee, Mr. Chairman, as you know, for 31 years.

When I was first elected to Congress and was elected to the Committee on Appropriations, our Chairman at the time was Clarence Cannon of Missouri. Mr. Chairman, as you probably recall he said to me if I would go on the District of Columbia and Foreign Aid Subcommittees, he would let me select my third Subcommittee and I could have any one I wanted, and I selected Agriculture.

I have been here ever since, Mr. Chairman, and I want you to know that it is a distinct honor and a privilege for me to serve with you and our other friends on this Subcommittee.

Dr. Greenwood, during this whole time that I talked to you about, I have always believed that the Extension Service is one of the successful programs and services in our Federal Government and one of the great achievements of our present agriculture program.

Do I understand you to say that you want to cut this Extension Service 60 percent?

Dr. GREENWOOD. That is the recommendation in this budget.

Mr. NATCHER. Dr. Greenwood, would that be $187,965,000? Is that about right?

Dr. GREENWOOD. Yes, in the neighborhood of $200 million, yes.

Mr. NATCHER. I recall, now, Mr. Chairman, that three or four years ago when Dr. Greenwood appeared before our Subcommittee she submitted to us a proposal for Extension which, in turn, if accepted would have phased out the entire system in about five years.

Dr. Greenwood, when you were testifying about that, I watched you very closely and I could tell that you did not believe in it; you did not want it; and you were not in favor of it. You could not say it.

Well, I can just tell by looking at you, and I don't believe, Dr. Greenwood, that in good faith if you had your way that you would cut Extension $187 million. Agriculture, I believe, is in a more serious crisis and situation today than at any time in the last 40 years.

The American farmer owes $214 billion, $79 billion of that is to the Farm Credit System.

We are trying to keep the young boys and girls in agriculture. One of the main ways to do it, as you well know, Dr. Greenwood, is to have a strong Extension Service. There is where you keep them.

They come to see me, Mr. Chairman, and they come to see you and the other members of this Subcommittee every month and talk to us about living on the farm and whether or not they should do it. I say to you I think it would be a serious mistake to cut Extension $187 million or to cut it any amount, Dr. Greenwood, from the figures that we had last year of $327,965,000.

You know, they say to us, as my good Chairman has pointed out, they want a 13 percent increase in defense, a 16 percent increase in foreign aid, and look what they are going to do to agriculture.

This bill, Mr. Chairman, as you well know, when it is presented to our Committee each year, contains a little over $30 billion. You take pure Food and Drug out, take out Food Stamps and some of the nutrition programs, and you have $8 or $9 or $10 billion in the bill for agriculture; but they want $16, $17, and $18 billion for foreign aid.

Dr. Greenwood, I think it would be one of the worst mistakes that this Congress could make to cut your bill one penny under last year, and I say that to you frankly. I know as well as you and these other ladies and gentlemen that are with you from the Department of Agriculture that a national debt of $2,069,777,000,000 is the most serious problem we have today—I know that—and I know when you are talking about bringing a deficit down to $144 billion, that is a major problem.

But, Dr. Greenwood, if we are not going to educate the boys and girls in this country, our children, to take care of the health of our people and have a strong agriculture system, we will not survive.

You know, Dr. Greenwood, when they talk about agriculture, they don't generally go to some other Committee; they come and see my friend, Jamie Whitten. That is who they come and talk to.

Seven of our bills had to go under a Continuing Resolution for 1986. The one I am Chairman of, I have the health money and the education money. The President signed that one.

Six he signed; seven we put under a Continuing Resolution and agriculture was under the resolution.

I have served on this Subcommittee, as I say to you, for 31 years. Never have we had to put this bill under a Continuing Resolution before the last two years.

Agriculture, $4 or $10 billion, not counting CCC; but say to the American farmer and the farm wife in this country, "We don't believe in extension anymore" Every farmer knows how to produce;

the farm wife knows how to can all of the necessary vegetables and everything. We don't have to carry the message to them.

Dr. Greenwood, you know a lot more about Extension than I do, and you know that is not true. You know that it is more important today than it has been at any time in the history of this Service.

I say to you, Mr. Chairman, I generally stay with you on all matters; but, Mr. Chairman, as one member of the Subcommittee I could not go along on a 60 percent reduction in Extension, under no circumstances. I would rather see it come out of some other bills.

I know where it could come from, Dr. Greenwood; I know where to take it out, and it ought to go back into Extension.

Mr. Chairman, I did not mean to take this much time, but that is the way I feel about it and I feel, down deep in my heart, Dr. Greenwood—you know, we will bring out a bill. My Chairman will bring you out one that you will like.

You will not be able to say you like it; but you will like it. [Laughter.]

Mr. NATCHER. You remember, Dr. Greenwood, what I tell you. You will like it.

AGENT SALARIES

Dr. Greenwood, you have always been exceedingly nice to us when you appear. You always make a good witness. Bring that table up to date that I want in here every year.

Dr. GREENWOOD. On salaries?

Mr. NATCHER. On salaries, right. [Laughter.]

Mr. NATCHER. The county Extension agents and home demonstration agents don't make enough money in this country. You and I know it.

Mr. Chairman, I am sorry I have taken all this time; but thank you very much.

Mr. WHITTEN. May I thank my colleague for the nice statement.

In case you all wonder whether he is for you or not, you should have listened. [Laughter.]

You know, one of the biggest jobs in the country is handling an HHS Bill, money-wise and otherwise. But Mr. Natcher always has time to take care of agriculture and the basics that is our own country.

I appreciate his kind statement here. But we have always known that we would find him in this corner; and I say that about other members of this Subcommittee that have not been here that long. I don't believe there is anyone here, he or she, who fails to recognize the value of the Extension Service. We just cannot afford to kick the basic support out from under the country's economy.

As I say, you might forgo a leak in the roof, but you cannot forgo the foundation of the building.

I yield at this time to Mr. Traxler.

Mr. TRAXLER. Thank you, Mr. Chairman.

Just very briefly—we are going to be voting; that is a quorum call and it will be followed, probably, in 10 or 15 minutes with the vote and I know my friend, Mr. Myers, will have something to

say—I want to simply adopt the kind words of Mr. Natcher, that we appreciate the circumstances under which you operate.

We know where your real heart is. You are maybe saying, "No, no", but your eyes are saying "Yes, yes." [Laughter.]

We are going to do what is right for all those Cooperative Extension people out there at the urging of Mr. Natcher and with the assistance of our good Chairman.

FUTURE OF EXTENSION

Dr. Greenwood, how times change. Five years ago you were smiling because your budget was being increased. Today you're being treated in the President's budget as the blacksheep of the family. What does this budget mean for the future of Extension, or would it be more accurate to say for the end of Extension?

Dr. GREENWOOD. This budget proposal, if enacted, will present the most significant challenge to the Cooperative Extension system, since its inception about 75 years ago.

However, I believe that it will not result in the termination of the Extension System. Providing assistance to the farm and rural community with applicable educational programs, will still be accomplished by the Federal and State partners.

EXTENSION SERVICE 1986 VS. EXTENSION SERVICE 1981

Mr. TRAXLER. Funding for Smith-Lever 3b and c has not been overly generous in recent years. Could you compare for us the Extension Service of today with the Extension Service of five years ago?

[The information follows:]

Extension Service	Fiscal year—		Plus (+) or minus (−)	
	1981	1986	Dollars	Percent
Appropriated dollars (thousands)	292,269	342,747	+50,478	+17.3
Constant dollars (based on 1972=100) (thousands)	142,779	146,223	+3,444	+2.4

STATE AND LOCAL FUNDING

Mr. TRAXLER. Extension funding is a partnership. Some partners are dragged along unwillingly, and the President may have to be this year. If the budget is approved as requested, how do you think States and Counties will respond? Will many increase their funding, or will they simply say that they won't fund programs either?

Dr. GREENWOOD. We have not heard from all States as to their plans for a reduced federal presence in the extension program. Most of the States are under tight budget conditions and have already presented their funding requests to their State legislatures for action. Adjustments to these requests will be very difficult.

Mr. TRAXLER. The Michigan Extension Lay Leaders were in Washington last week, and some of them sat in our hearing with the Soil Conservation Service. They were amazed at the number of times it was suggested that "State and local governments will con-

tinue those programs of importance". Have you or has anyone in the Department ever conducted a survey to see if this is true?

Dr. GREENWOOD. To the best of my knowledge no formal survey has been accomplished. In discussions with our State cooperators they have indicated that although the effort will be greatly reduced, extension programs which address localized high-priority needs will be continued.

NEEDS OF FARM OPERATORS

Mr. TRAXLER. Your budget also proposes that we mandate that other services can be provided "only after the needs of farm operators have been met." How do you define "the needs of farm operators"? Some of my farmers need better prices. Will you be responsible for that?

Dr. GREENWOOD. No, I am afraid that may be beyond our scope. The budget language refers to Extension educational programs which meet the needs of farm operators which, as yet, needs to be defined.

Mr. TRAXLER. Who defines "the needs of farm operators"? Will it be published in the Federal Register and open for public comment? Some of our urban colleagues think farmers need to get out of farming. Could they suggest that as a "need"?

Dr. GREENWOOD. I suppose that it would be ultimately our responsibility working with the Administration and the Congress to define "the needs of farm operators." The budget explanatory language does include some further clarification, mentioning assistance to farmers in financial stress; education and analytical support to assist farmers in adjust to newly authorized farm programs; assistance in addressing groundwater quality and other national resources conservation issues; and other types of assistance to rural areas. It may be appropriate to seek public comments on this issue. As a matter of fact, some of our financial management programs include assistance to farmers in making an orderly transition out of agriculture as well as assistance in securing non-farm operations. Let me emphasize, however, that these programs are offered in an educational context. In no way do we deliberately encourage farmers to get out of farming.

Mr. TRAXLER. Who proposed this limitation? You or OMB?

Dr. GREENWOOD. The limitation came from OMB.

EXPANDED FOOD AND NUTRITION EDUCATION PROGRAM

Mr. TRAXLER. Have we done enough to meet the need for the EFNEP program so that the program can be terminated, or would you agree that there continues to be a need?

Dr. GREENWOOD. There continues to be a need for nutrition education. The program is targeted to low-income homemakers, and especially those with young children, with the express purpose of helping them manage their food resources—food stamps, money, home gardening, etc.—in order to improve their diet. This target population is a constant segment within the population, and has been increasing in recent years. As individuals mature and new families form, many lack the basic, essential educational foundation of knowledge and skills provided by EFNEP. Other Federal

and State agencies may still conduct programs or redirect efforts to meet the information needs of this audience.

Mr. TRAXLER. The Food and Nutrition Service told us yesterday that they want to change all of the restoration in benefit levels in the food stamp program back to where they were before the Farm Bill. If benefits are cut back to those levels, would you say we have a greater or lesser need for the EFNEP program?

Dr. GREENWOOD. The need for nutrition education is almost always present in the targeted audience. Whenever their resources are cut back the need to manage the household food supply and other essentials for living becomes greater and the ability to implement what they learn becomes more difficult.

Mr. TRAXLER. I have been receiving a large number of letters from people in my District who want to see funding for the EFNEP program restored. Many of these people have no immediate contact with the program, but appreciate its importance. Who should I listen to: my constituents or the President with his budget?

Dr. GREENWOOD. I'm afraid I cannot answer that question. I realize the difficult task you and your fellow congressional representatives have in determining the course to be taken and the priorities to be developed for the overall good of the nation.

URBAN GARDENING

Mr. TRAXLER. The Urban Gardening program is once again proposed for termination. How much has this program helped you with other programs like the master gardener program?

Dr. GREENWOOD. The USDA Urban Gardening Program has served as a vehicle for the introduction into inner-city low-income persons of other Extension programs. Volunteer programs such as the master gardener, master food preserver, and others have been implemented with these non-traditional clientele. The Urban Gardening Program has also served as a focal point for urban beautification programs conducted in conjunction with city agencies and housing authorities.

Mr. TRAXLER. I understand that one of the most popular features of a garden show here in Washington this past weekend was a plant clinic both operated by the Extension Service and many of the graduates of the master gardener program. Will this kind of presence be possible if your budget is adopted?

Dr. GREENWOOD. Programs dealing with other than primarily meeting the needs of farm operators would have to be determined by the States.

FINANCIAL MANAGEMENT

Mr. TRAXLER. I have been hearing a great deal of praise from my constituents for the financial management program offered by Extension. They certainly believe that this program is needed by farm operators. In fact, I understand that there have been a number of private contributions in support of the program. What was your original request of the Department for funding this program?

Dr. GREENWOOD. Our original FY87 budget request to the Department for this item was $19 million. We incorporated the short run emergency financial assistance programs provided by Congress in

FY85 and FY86 into a longer run thrust call "Restoration of Agricultural Profitability."

Mr. TRAXLER. Given the current problmes facing farmers, is there anything that you are doing that you might consider more vital or more helpful than the financial management assistance program?

Dr. GREENWOOD. We believe these programs are among the most vital, helpful programs which can be offered to farmers by Extension at this time.

Mr. TRAXLER. I am particularly interested in a program being run in Michigan in cooperation with the State government in which Extension helps to retrain farmers for other jobs. No one wants to think of leaving the farm, but I am sure that this program is designed for the plain fact of the matter that farmers need to develop additional skills. What can you tell me about the program?

Dr. GREENWOOD. The Michigan Cooperative Extension Service has the leadership for this program which is funded under Title III of the Federal Job Training Partnership Act through the Michigan Office of Job Training. The Michigan Cooperative Extension Service is working with the Michigan Employment Security Commission, private industries counsels, community colleges and other local organizations in providing job training and assistance in locating employment for farm families and their employees who are being forced out of agriculture, as well as, to those who will drastically curtail farming operations to improve business cash flow.

RENEWABLE RESOURCES EXTENSION ACT

Mr. TRAXLER. We keep hearing about developing other sources of income for farmers by trying to find ways of doing more with what they already have. I believe that this is one of the goals of the renewable resources program. What has been the payback from this program compared to its total cost?

Dr. GREENWOOD. A fundamental emphasis of renewable resources programs across the nation has been to teach landowners how to identify and assess potential investment and income generating opportunities, train them in how to more profitably manage their enterprises and how to participate in the market place. Let me use a forestry example from Alabama as an illustration. A new four county forestry Extension position was jointly funded with a private forestry industry using RREA funds as a leverage. The initial impact is that 50 landowners invested in forest management practices on 4,500 acres. The potential wood supply in the area was increased by 3.5 million cubic feet over the next 30 years, with a 3.12 to 1 benefit/cost ratio. In Michigan, a program that developed and taught lumber processing firms how to use a computerized program for selecting and utilizing lumber grades saved producers more than $1 million a year. We have numerous examples like this across all natural resources program areas (forestry, rangeland, wood utilization, fish and wildlife, outdoor recreation and environmental management and public policy).

Mr. TRAXLER. It is nice to have you before us.

We look forward to visiting with you again.

Mr. WHITTEN. I don't believe you could give any answers that would keep us from supporting you. Mr. Myers.

Mr. MYERS. Thank you, Mr. Chairman.

I was just checking Mr. Natcher's figures here. My calculator is not large enough. I have to get a big one to compare all these big debts anymore.

Bill, that would have been right about 9:00 this morning, but it has gone up over $2 million, the national debt, since then.

Mr. NATCHER. John, would you yield to me just a minute?

Mr. MYERS. Sure.

Mr. NATCHER. It is not brought on by the American farmer. [Laughter.]

Mr. MYERS. Unfortunately, the American farmer is paying for it, though, even though they did not bring it on.

Mr. NATCHER. I agree on that.

Mr. MYERS. That is tragic. We brought it on ourselves. Maybe the members of this Committee did not, but Congress has voted for all these bills on things through the years.

We all want to go to heaven, but nobody wants to pay the price to get there. So I think we all agree.

STATE AND LOCAL INVOLVEMENT

The thing that concerns me: I was looking through here, your testimony, Dr. Greenwood, and California generated $4 for each dollar we spend; that is the state that generates more local involvement?

Dr. GREENWOOD. The most State and local funding.

Mr. MYERS. It is required, of course, by law that a state match dollar for dollar for Extension services.

Dr. GREENWOOD. For the general formula funds.

Mr. MYERS. General formula.

Dr. GREENWOOD. Yes.

4-H PROGRAMS

Mr. MYERS. And 4-H, where does that fall in?

Dr. GREENWOOD. 4-H would be a part of the programs currently funded through the general formula funds that are distributed to each of the states. That would be for general agricultural programs, for home economics and nutrition programs, 4-H, as well as those activities pertaining to community development.

Mr. MYERS. Is the decision going to be up to Congress whether we continue 4-H as it is, or is it going to be up to a cooperative between the states and you in the Extension Service?

Dr. GREENWOOD. The states would have a strong voice in terms of how they use the funds.

Mr. MYERS. Well, the Chairman often talks about the 4-H, and we all do. I think all of us have been in 4-H through the years and had various capacities since then for the 4-H. I think Howard Diesslin is back here someplace. He is hiding, but while I was in the 4-H, Howard was at Purdue. He is a lot older than I am, but——[Laughter.]

Anyway, we have all been supporters of 4-H and we certainly do not want to see it—but if California can generate $4 to match each dollar for 4-H——

Dr. GREENWOOD. They match for the total Extension Program.

Mr. MYERS. Yes. Well, you said 4-H was the matching——

Dr. GREENWOOD. It is part of it, yes, sir.

Mr. MYERS. Okay; and 30 states match 2 for 1 at least.

What indication have you had from the states? We hear from them all the time. Have you heard what they are going to do with 4-H?

Dr. GREENWOOD. I hear them making assessments in terms of what they are going to do with the total Extension program.

Mr. MYERS. But they don't think about 4-H.

Dr. GREENWOOD. They would consider that as part of the total effort and consider it as an important program area.

Mr. MYERS. We talked a few years ago about cutting back the revenue foregone for the Post Office. What did the Post Office say? "Well, we are going to quit Saturday deliveries," and various things. They always threaten the one they know they can get back.

Are you doing that to us here by saying 4-H will be dropped?

Dr. GREENWOOD. No. I would have to say that it has made an important contribution to rural America.

Mr. MYERS. No, but you know that we will replace it. We have always put the money back in because we don't want to see service dropped by the Post Office. Are you doing that? Are you cutting a program you know we will put back in?

Dr. GREENWOOD. It is only one of several programs proposed for reduction.

Mr. MYERS. I don't think I am going to get an answer. [Laughter.]

Mr. MYERS. Thank you very much.

Dr. GREENWOOD. Yes. Thank you, sir.

Mr. WHITTEN. Mr. Akaka.

EXTENSION AND HOME ECONOMICS

Mr. AKAKA. Your budget request proposes that support be reduced for nutrition programs, the 4-H program and home economics programs. How have USDA extension programs helped farmers survive the recent farm crisis? What programs do you have to help farm families get through tough financial difficulties?

Dr. GREENWOOD. By providing intensive individualized counseling to farmers Extension programs have helped them understand the various options that are available to them. These Extension programs utilize in-depth workshops with small group of farmers which are often followed by one-on-one assistance to the farm family. The farm family is assisted in determining the family goal for their farm business and assistance in analyzing the alternative courses of action which are feasible for their situation. This usually results in the preparation of a revised farm financial plan—including debt restructuring—a revised farm enterprise operating plan, and a cash flow projection for the year ahead. These plans have been extremely helpful as the farmer works with his lender on obtaining financing. Also, the preparation of these plans help reduce

the feeling of uncertainty about the future and thus reduces the amount of emotional stress and tension in the farm family. Survey data from the State Extension Services indicated that approximately 100,000 farm families had received this intensive type assistance in the two years up to September 1985. We estimate that at least 50,000 to 60,000 farm families will be provided similar assistance in FY 86.

Mr. AKAKA. If funding for these programs are deleted, who will carry out these services in rural America?

Dr. GREENWOOD. Extension has provided training and farm financial management to personnel from banks, other lenders, other agricultural teachers, and institutions at local colleges. These sources can draw on the subject matter expertise of the whole Land Grant College of Agriculture in conducting its programs directly with farmers and for the training programs for other professional personnel.

Mr. AKAKA. What percentage of funds spent on home economics programs is federal assistance and how much comes from other sources?

Dr. GREENWOOD. We estimate that over 22% of extension's efforts are expended in the home economics area. This totals approximately $72.8 million from federal extension funds.

Mr. AKAKA. Thank you, Mr. Chairman.

Mr. WHITTEN. Our colleagues Mr. Watkins and Mr. AuCoin could not be here but they have some questions they would like answered for the record. Thank you for your testimony Dr. Greenwood.

TECHNOLOGY TRANSFER

Mr. WATKINS. What is the status of the pilot technology transfer project in Oklahoma that was funded at a level of $350,000 for the states of Oklahoma and Mississippi? Would you agree there has been a degree of success to this program?

RESPONSE. Oklahoma is embarking on a plan of work involving (1) liaison with industry to identify productivity improvement needs, (2) creating a network of technology agents from the ranks of graduate students in Ag engineering and (3) linkage of the industry needs by the agents with technology in the research community in order to improve business profitability. The approach is results oriented, links research and Extension, and has transferability potential to other States.

Mr. WATKINS. Are you asking that this project not be continued for FY 1987?

RESPONSE. We are proposing that no Federal funds be used to continue this project.

Mr. WATKINS. What is the department's reason for proposing this measure?

RESPONSE. The proposed elimination of Federal funding is the result of the need to set priorities within the constrained Federal budget.

BUDGET PROPOSAL

Mr. WATKINS. I have always said that I am a product of the 4-H and FFA youth organizations. I consider it extremely important to

have these kind of programs in place. I know the Chairman and Mr. Natcher, a member of this subcommittee and Chairman of the Educational Appropriations, supported these programs long before I came to Congress. When I see a budget that uproots the future of America, I become concerned. A 59% reduction in federal funding would do just that. I don't think you believe in this budget any more than I do.

Could you explain in detail what your proposal would do to the rest of Extension if federal funding was narrowed to serve farm operators only before anyone else or program could be served?

RESPONSE. The details as to the impact of this proposed restriction in our appropriation language are not completely known. The needs of farm operators will have to be more fully defined. However, it appears that if our State and local partners choose to provide educational programs and information to families outside the farm and include urban clientele, agribusinesses, 4-H's or communities, they would do so using funds from other sources.

Mr. WATKINS. As I recall, on almost every piece of material that Extension prints and distributes there is a statement that says Extension does not discriminate with the people it serves. If we followed your advice, wouldn't we be discriminating and going against the very principles of the Extension Service?

RESPONSE. The proposed budget reduction and the restriction in the appropriation language are not meant to be discriminatory. The proposal to target Federal funds to the needs of farm operators first is in response to the current farm crisis and the need to maintain assistance to these groups even during tight budget restrictions.

Mr. WATKINS. How would this language effect the 4-H program?

RESPONSE. Unless the program was related to meeting the needs of farm operators, it would have to be funded from other than Federal dollars.

Mr. WATKINS. How would it effect home economics programs?

RESPONSE. We anticipate that Federal funding these programs will be greatly reduced throughout the cooperative extension service, in order to accommodate the emphasis in supporting regaining profitability and soil and water conservation.

Mr. WATKINS. Considering the times we are going through in agriculture, there was never a more important or successful program than this one. Oklahoma was one of 18 states to participate in the project last year. The Oklahoma project received 139 crisis calls. Nearly 900 farmers and ranchers have participated in one and two day workshops in the last year. Nearly 300 Oklahoma farm families have requested follow-up financial management assistance and have taken a hard look at options to help them stay in farming. Many of these farmers were on the verge of folding until extension specialists helped them analyze their financial status. How successful has this program been in the rest of the nation?

RESPONSE. This program has been very successful nationwide. A national survey was conducted in August, 1985, to determine Extension System's response to the farm financial crisis. The data gathered in the survey indicated that during the past two years, almost 100,000 farmers had been provided highly intensive individualized assistance similar to the type of help provided farmers in

Oklahoma. During the fall and winter months of 1985–86, still additional numbers of farmers have been provided this type of assistance (probably another 50,000). Extension programs have also helped provided intensive assistance indirectly by substantially expanded training programs for professional staff of agricutural lenders, vocational agricultural teachers, etc. Our data indicates that another 80,000 farmers were assisted through these efforts.

Mr. WATKINS. In your opinion, do you believe there were cases that this program offered solutions for a farmer to work out of his problem?

RESPONSE. Yes, there have been many such cases where the farmer has been helped to decide on a course of action. Our survey data which was mentioned in the previous question indicates that 80% of the approximately 100,000 farmers have decided on a definite course of action while the Extension staff was still in touch with them. About one-half of them had decided on a course of action that would involve continuing in farming on a full-time basis. Another one-fourth planned to continue farming on a part-time basis.

Mr. WATKINS. Were there times that this program provided the advice and counsel needed that prevented a suicide?

RESPONSE. Although conclusive evidence is difficult to obtain, we feel that our individual couseling programs have been of tremendous help in reducing emotional stress and tension between family members. Our field staff consistently report that as a farm family is assisted to objectively sort out and understand what are their realistic options for the future, and then decide on a course of action, that the emotional stress and tension in the farm family greatly subsides. In addition, Extension has conducted specific programs to help farm people deal with the stress resulting from their financial problems. The national survey data indicated that of the approximately 100,000 farmers provided intensive farm financial assistance, that over 36,000 were provided intensive assistance with major stress problems.

Mr. WATKINS. If this program was able to save a few lives and keep a small number of farmers on the land it was worth the money spent. I believe it was far greater than that. How many farmers were actually served in this effort?

RESPONSE. Our data shows Extension provided intensive assistance to approximately 100,000 farm families in the two years prior to September, 1985. In the current year, we expect to provide similar assistance to at least 50,000 to 60,000 farm families. Also, we have intensified our training programs of professional staff of other organizations primarily lenders and vocational agricultural instructors who have in turn provided intensive assistance to an estimated 80,000 farmers, and we expect that similarly trained professionals will assist over 90,000 farmers in FY86. In addition, less intensive types of assistance—through workshops, publications, media supplied information, etc. has been provided to even larger numbers of farm families by Extension programs.

EFNEP PROGRAM

Mr. WATKINS. The Expanded Food and Nutrition Education Program affects my district more than any other Congressman in Oklahoma. I have 7 out of the 10 EFNEP programs in Oklahoma located in my district. With double-digit unemployment and consistently having 9 out of the top 10 unemployment in the state in my district this kind of program is crucial. We have a successful program in Oklahoma. As a result of EFNEP, many families have left welfare, entered the labor market, increased self-confidence and improved time and money management skills. I content this program is one that is needed if we are to provide poor people with the education needed so they can have a proper diet. Has the EFNEP program had similar success in other states?

RESPONSE. Yes, the EFNEP has had similar success in all parts of the country and the efficiency of the program is improving. For example, a Michigan report illustrates many of the points you have made about the Oklahoma progam. In Michigan, in addtion to teaching basic nutrition concepts the program also teaches food buying skills, menu planning, food preparation skills, proper food storage, sanitation, management of available resources, gardening, and food preservation. The knowledge and skills taught are critical to the health and well being of this target audience. In 1984, Michigan had 51 percent of their enrolled homemakers living in rural areas, 45 percent were minorities, 78 percent were food stamp recipients, 43 percent were also WIC participants.

Mr. WATKINS. Could you provide for the record the number of people served over the last several years?

[The information follows:]

	1981	1982	1983	1984	1985
EFNEP Homemakers	256,548	263,536	258,287	235,194	224,609
EFNEP Youth	575,119	524,302	472,411	454,847	428,422

Note: In FY 1985, EFNEP operated in 813 sites with 224,609 EFNEP Homemakers participants, representing about 853,500 family members, and 428,422 EFNEP Youth participants.

Mr. WATKINS. What would have been the status of the diet and health of these individuals had this program not been available?

RESPONSE. It is hard to judge what the diet and health status would have been had they not entered the program, and each starts from a different level of knowledge and practice.

RURAL DEVELOPMENT CENTERS

Mr. AUCOIN. Is the Extension Service working on issues of nonfarm income, which accounts for 60 to 70% of farm and ranch family income?

RESPONSE. Yes, the Extension Service has been very active in programs concerned with the interdependencies between farm and ranch, and off-farm/ranch family income. Virtually all the States, including Puerto Rico and the Virgin Islands, report a variety of programs in support of financially distressed farm families. Most include counseling and small group workshops intended to aid families and communities with the off-farm employment and income

generating opportunities. However, the initial and intensive phase of individual counseling leads to a second phase where there is a need for an awareness of the impacts on the community and the need for employment opportunities. Many State Extension programs are also dealing with this second phase.

Mr. AUCOIN. Have the regional rural development centers played a significant leadership role in these efforts in the states?

RESPONSE. Yes. Though all Centers are active, two Centers have supported early work in the area of agriculture and community interdependencies, farm and off-farm rural development. Over a year ago the North Central Center at Iowa State University sponsored the first conference on the topic and since then has supported two follow-up information sharing conferences. Several years ago the Western Center at Oregon State University began work on two projects, "Hard Times" and "Communities in Transition". These two projects are efforts to help communities deal with boom and bust of energy development and the down turn of natural resource, initially forestry and minerals but later fishing and now agriculture, dependent communities.

Mr. AUCOIN. Would a loss of the regional rural development centers negatively affect the ability of states to address issues of farm family income?

RESPONSE. Due to budget restrictions many State Extension programs have reduced community and rural development activity. As this has happened the Centers have been the mechanism that allows States to share the remaining Extension rural development expertise across state lines. The need is to share all program expertise relative to the question of rural revitalization. The Centers are uniquely structured to perform this function for they already have a record of working on such programs.

Mr. AUCOIN. Are the regional rural development centers cost-effective in assisting state Extension efforts to address issues relating to the revitalization of rural America?

RESPONSE. We believe the Centers to be cost effective in addressing this issue.

Mr. AUCOIN. Are the rural development centers initiating, sponsoring, and providing leadership for research that looks at the changing structure of America's rural industries: agriculture, forestry, fishing, and mining?

RESPONSE. Yes. The Centers afford the opportunity for both the research and Extension functions to coordinate research and transfer research findings on these rural industries.

EXTENSION SERVICE

Statement of Dr. Mary Nell Greenwood, Administrator, Extension Service, before the House Subcommittee on Agriculture, Rural Development and Related Agencies.

Mr. Chairman and members of the Committee, I appreciate the opportunity to discuss with you the proposed FY 1987 President's budget for the Extension Service.

The Cooperative Extension System provides nationwide leadership in adapting and transferring science and technology in agriculture, forestry and nutrition related sciences for this nation's producers, businesses, families and communities. Assessing research and technology from across the nation (whether from the Agricultural Research Service, the Cooperative State Research Service, Forest Service, Economic Research Service, other public and private sources) and throughout the world, Extension tailors appropriate technology to site-specific conditions, maximizing the value of research independent of where it is done. This application and utilization contributes to productivity, economic growth and human expertise development.

The system with its federal, state and local partners and network of national, state, and county advisory councils anticipates and responds to conditions and problems whether national or local in magnitude. The system mobilizes its educational resources to respond to national emergencies, natural disasters, and federal regulations and policies. This system is enhanced by a cadre of

volunteers and leaders. A recent study indicates Extension has a network of nearly 2.9 million volunteers who contributed expertise, time and other resources to the planning and implementation of programs. They also become effective leaders for their communities, organizations and government.

The 1987 budget would reduce the Federal Extension budget by roughly 60 percent. The key word here is "Federal." The Federal Government has been contributing approximately one-third of the dollars used for Cooperative Extension Programs. Certainly, we would hope that states and local governments would assume more of the financial responsibility for supporting those programs which they deem to be of value.

It is interesting to note the varying degree to which the states support Extension activities. As an example, the State of California presently expends $4 in state funds for each federal dollar. In 30 states, state support exceeds by more than two-to-one the federal contribution. All states are obligated by law to provide a one-to-one match on formula funds. A reduction of the magnitude we have proposed will present a significant challenge to the Extension system, but I am confident that this system, which has served American agriculture so well, will adjust and continue to fulfill a significant role.

Under this proposed budget, the Extension Service would continue to provide overall coordination and program assistance to state and local cooperators and would provide $135.1 million in general formula programs for 1862 and 1890 institutions, and the District of Columbia. We would, however, support Extension work to address high priority national concerns, such as

restoration of profitability to American agriculture, proper management of natural resources and rural development.

We have proposed to eliminate the earmarked programs. The Expanded Food and Nutrition Education Program (EFNEP) is presently utilizing $60.4 million in Federal funds. The program is designed to provide nutrition information to low income families. Other Extension, Federal and State programs are targeted at the general population.

For some Extension programs, the Federal support has consisted of earmarked assistance which the States have used as "seed" money to develop, using additional resources, the program level appropriate to the needs of the clientele. When Congress enacted the Gramm-Rudman-Hollings legislation, USDA assumed a large part of the responsibility for reducing Federal expenditures. Therefore, as in previous proposals, the 1987 budget would eliminate these earmarked programs in favor of the general formula distribution.

Another important area of federal support is in adapting and transferring science and technology to producers, businesses and communities. It is this facet of the Federal role which is emphasized in the 1987 budget. ES, USDA, will continue to provide assistance to the states in defining priorities, identifying and utilizing the latest Federal and State research and coordinating efforts to solve problems of mutual interest. ES will also continue to support and monitor innovative approaches and assist in the transfer of those approaches nationwide.

Federal funding will address high priority concerns such as assistance to farm families and communities in coping with financial stress, water quality and

management including groundwater and developing understanding of federal regulations, policies and programs. A recent survey indicates that, during the past two years, nearly 100,000 farm families have received intensive assistance in developing a farm business and financial plan. This assistance entails preparation of cash flow projections, financial statements and a plan of action to address their individual financial situation. This help is vital in deciding whether to remain in farming, to rely on part-time employment to supplement farm income or whether to develop a new career. Other sources of this type of assistance are simply not in place to address the immediate needs for help. Although a large number of families have received this assistance, we estimate that more than twice that number will need this help in the near future.

Water quality and conservation including groundwater is another major issue facing agriculture. Surveys continue to identify groundwater contamination problems, many involving pesticides and fertilizers used in agricultural production. Scientists are just beginning to understand the potential movement of these chemicals through the soil and groundwater aquifers. Crop management practices play a role in the fate of these chemicals, and also can reduce the amounts required, thereby lowering production costs.

Three Federal agencies -- USDA, EPA and the Interior Department -- have research, education and regulatory roles in groundwater conservation. A consistent approach to dealing with this national issue demands Federal involvement to identify and integrate significant outputs from the involved Federal agencies. Through ongoing education programs, Extension is in a position to gather and disseminate this information in a consistent manner to those most in need.

Extension will continue to play a major role in developing understanding of federal regulations, policies and programs, e.g., the implementation of the new conservation reserve program authorized in the 1985 Agriculture and Food Security Act.

Under the conservation reserve program, farmers with highly erodible cropland can enter into long-term (10-year) land retirement contracts. Sodbuster and swampbuster programs are designed to discourage use of highly erodible land or wetlands by denying farm program benefits to farmers who produce on those lands. Extension Service will assist farmers by providing information on the new conservation reserve program and providing decision aids on the range of available alternatives.

Mr. Chairman, these are some of the vital issues facing the nation's farm families and communities in which Extension must play a major role.

There is no doubt the 1987 budget proposal will force this very unique cooperative system to change -- to refocus and to confront new challenges.

Without question, if this proposal is enacted, the impact on the Extension System will be significant...its role, its scope, its outreach will be impacted. The Federal presence and investment, although at a significantly reduced level, is needed to make this system nationwide in scope and responsive to national as well as state and local issues.

I believe that the system can continue, with certain restraints, to be effective and valuable to the American people in the future as it has been during the past 75 years.

Mr. Chairman, this concludes my statement. I will now endeavor to respond to questions you and members of the committee may have.

EXTENSION SERVICE

Purpose Statement

Cooperative extension work was established by the Smith-Lever Act of May 8, 1914, as amended. Legislation authorizes the Department of Agriculture to provide, through the land-grant colleges, cooperative extension work that consists of the development of practical applications of research knowledge and the giving of instruction and practical demonstrations of existing or improved practices or technologies in agriculture, home economics, related subjects and to encourage the application of such information by demonstrations, publications, and other means to persons not attending or resident in the colleges. This work is further emphasized in Title XIV (National Agricultural Research, Extension, and Teaching Policy) of the Food and Agriculture Act of 1977, as amended in 1981 and 1985.

To fulfill the requirements of the Smith-Lever Act, state and county Extension offices in each State, the District of Columbia, Puerto Rico, the Virgin Islands, Guam, American Samoa, the Northern Marianas and Micronisia, conduct educational programs to improve American agriculture and strengthen the Nation's families and communities.

The Extension Service, USDA, provides national leadership and represents the U.S. Department of Agriculture within the Cooperative Extension System. As of September 30, 1985, there were 171 full-time permanent employees and 16 other than full-time permanent employees, all located in the D.C. metropolitan area.

EXTENSION SERVICE

Available Funds and Staff-Years

1985 Actual and Estimated, 1986 and 1987

Item	1985 Actual	Staff-Years	1986 Estimated	Staff-Years	1987 Estimated	Staff-Years
Extension Service	$343,681,000	172	$342,701,000	178	$140,000,000	91
Obligations under Other USDA Appropriations:						
Agricultural Stabilization and Conservation Service -						
Rural Clean Water Project	364,612		375,000		--	
Agricultural Research Service -						
Support Services	6,360		3,000		3,000	
International Rural Youth Conference	15,000		--		--	
Apples & Related Crops Project	16,325		--		--	
Evaluation Studies	65,000		75,000		75,000	
Animal and Plant Health Insp. Ser. -						
International Rural Youth Conference	--		15,000		--	
Cooperative State Research Service -						
International Rural Youth Conference	15,000		--		--	
Apples & Related Crops Project	16,325		--		--	
Aquaculture Program	--		30,000		30,000	
Economic Research Service -						
International Rural Youth Conference	--		15,000		--	
Farmers Home Administration -						
Computer Management Program	92,000		--		--	
Federal Crop Insurance Corporation -						
Crop Insurance Workshops	120,000		150,000		150,000	
Nature & Role of Crop Insurance	230,000		200,000		200,000	
Food Safety and Inspection Service -						
International Rural Youth Conference	15,000		--		--	
Foreign Agricultural Service -						
WORLD - Data Information Service	1,500		2,000		2,000	
Forest Service -						
International Rural Youth Conference	15,000		--		--	
National Agricultural Library -						
International Rural Youth Conference	15,000		--		--	
Office of Int. Coop. & Devlp -						
International Rural Youth Conference	10,000		--		--	
US/USSR Exchange	20,000		--		--	
Soil Conservation Service -						
International Rural Youth Conference	15,000		--		--	
Soil & Water Conservation Program	30,000		--		--	
Miscellaneous Reimbursements	25,442		--		--	
Total, Other USDA Appropriations	1,087,564	--	865,000	--	460,000	--
Total, Agriculture Appropriations	344,768,564	172	343,566,000	178	140,460,000	91

Item	1985 Actual	Staff-Years	1986 Estimated	Staff-Years	1987 Estimated	Staff-Years
Other Federal Funds:						
Reimbursements:						
AID-PASA International Extension	3,966,372		4,100,000		4,100,000	
Department of Interior -						
Fish & Wildlife Recognition Program	6,200		10,000		10,000	
Environmental Protection Agency -						
National Chemigation Guidance	10,000		--		--	
Pesticide Application Training	1,352,300		1,400,000		1,400,000	
Total, Other Federal Funds	5,334,872	--	5,510,000	--	5,510,000	--
Non-Federal Funds:						
Federal Assistance Program Retrieval	12,000		20,000		20,000	
Federal Telecommunications System	80,712		75,000		75,000	
Federal Building Fund	494,457		500,000		500,000	
Cost Share Printing	30,255		30,000		30,000	
Total, Non-Federal Funds	617,424	--	625,000	--	625,000	--
Total, Extension Service	350,720,860	172	349,747,000	178	146,595 000	91

	1985 Actual	1986 Estimated	1987 Estimated
Full-Time Equivalent Staff-Years:			
Ceiling	171	177	90
Non-Ceiling	1	1	1
Total	172	178	91

EXTENSION SERVICE

Permanent Positions by Grade and Staff-Year Summary

1985 and Estimated 1986 and 1987

GRADE	1985	1986	1987 est. a/
ES-5	1	1	1
ES-4	2	4	4
ES-3	4	2	2
ES-2	1	1	1
ES-1	- -	- -	- -
GS/GM-15	31	31	16
GS/GM-14	33	33	17
GS/GM-13	11	11	6
GS-12	6	6	3
GS-11	5	5	3
GS-9	8	8	4
GS-8	8	8	4
GS-7	15	15	8
GS-6	34	34	17
GS-5	8	8	4
GS-4	16	16	8
GS-3	6	6	3
GS-2	2	2	1
Total, Permanent Positions	191	191	102
Staff Years:			
Ceiling	171	177	90
Non-ceiling	1	1	1
TOTAL	172	178	91

a/ Estimate of Permanent Positions by grade. Specific grade levels cannot be determined at this time.

EXTENSION SERVICE

CLASSIFICATION BY OBJECTS

1985 and Estimated 1986 and 1987

	1985	1986	1987
Personnel Compensation:			
Headquarters	$ 6,501,147	$ 6,994,000	$ 3,671,000
Field	- -	- -	- -
11 Total Personnel Compensation	6,501,147	6,994,000	3,671,000
12 Personnel Benefits	730,821	746,000	349,000
13 Benefits for Former Pers.	- -	- -	1,769,000
Total Pers. Comp. & Benefits	7,231,968	7,740,000	5,789,000
Other Objects:			
21 Travel	583,188	630,000	245,000
22 Transportation of things.	55,288	68,000	27,000
23.2 Communications, utilities & other rent.	16,915,800	17,199,000	371,000
24 Printing & reproduction.	283,104	336,000	131,000
25 Other services	3,105,877	1,834,000	731,000
26 Supplies & materials	227,688	227,000	88,000
31 Equipment	306,960	225,000	88,000
41 Grants, subsidies & contributions	314,645,204	314,442,000	132,530,000
Total other objects	336,123,109	334,961,000	134,211,000
Total direct obligations	343,355,077	342,701,000	140,000,000
Position Data:			
Average Salary, ES positions	$66,378	$67,110	$67,110
Average Salary, GS positions	$35,326	$37,048	$35,342
Average Grade, GS positions	9.70	10.05	8.97

EXTENSION SERVICE

The estimates include appropriation language for this item as follows (new language underscored; deleted matter enclosed in brackets):

Payments to States, Puerto Rico, Guam, the Virgin Islands, Micronesia, and American Samoa: for payments for cooperative agricultural
1 extension work under the Smith-Lever Act, as amended [by the Act of June 26, 1953, the Act of August 11, 1955, the Act of October 5, 1962] (7 U.S.C. 341-349), [section 506 of the Act of June 23, 1972, and the Act of September 29, 1977 (7 U.S.C. 341-349), as amended, and section 1361(c) of the Act of October 3, 1980 (7 U.S.C. 301n.),] to be distributed under sections 3(b) and 3(c) of said [the] Act, for retirement and employees' compensation costs for extension agents to assist farm operators, and for costs of penalty mail for cooperative extension agents and State extension
2 directors, [$240,035,000] $127,547,000; Provided, That Extension agents may provide other services only after the needs of farm operators have
3 been fully met; in addition [payments for the nutrition and family education program for low-income areas under section 3(d) of the Act, $21,597,000; payments for the urban gardening program under section 3(d) of the Act, $3,479,000; payments for the pest management program under section 3(d) of the Act, $7,486,000; payments for the farm safety program under section 3(d) of the Act, $1,014,000; payments for the pesticide impact assessment program under section 3(d) of the Act, $1,706,000; payments for carrying out the provisions of the Renewable Resources Extension Act of 1978, $2,485,000; payments for a financial management assistance program under section 3(d) of the Act, $1,491,000; payments for an integrated reproductive management program under section 3(d) of the Act, $49,000; payments for the rural development centers under section 3(d) of the Act, $720,000;] Payments for extension work under section 209(c) of Public Law 93-471, [$977,000] $399,000; and payments for extension work by the colleges receiving the benefits of the second Morrill Act (7 U.S.C. 321-326, 328) and Tuskegee University, [$17,741,000]
4 $7,204,000; in all, [298,674,000] $135,150,000; [of which not less than $79,400,000 is for Home Economics:] Provided, That funds hereby appropriated pursuant to section 3(c) of the Act of June 26, 1953, and section 506 of the Act of June 23, 1972, as amended, shall not be paid to any State, Puerto Rico, Guam, or the Virgin Islands, Micronesia, and American Samoa prior to availability of an equal sum from non-Federal
5 sources for expenditure during the current fiscal year; [and in addition, $38,627,000 shall be derived by transfer from the appropriation, "Food Stamp Program", and merged with this appropriation.]

Federal administration and coordination: For administration of the
6 Smith-Lever Act, as amended [by the Act of June 26, 1953, the Act of August 11, 1955, the Act of October 5, 1962, section 506 of the Act of June 23, 1972, section 209(d) of Public Law 93-471, and the Act of September 29, 1977 (7 U.S.C. 341-349), as amended, and section 1361(c) of the Act of October 3, 1980 (7 U.S.C. 301n.),] and to coordinate and provide program leadership for the extension work of the Department and
7 the several States and insular possessions, [$5,400,000] $4,850,000; [of which not less than $2,300,000 is for Home Economics.]

The first and sixth changes delete language citing specific legislative authorities which are covered in other places in the language.

The second change is to propose that the Federal share of funding primarily support those programs that are directed toward supporting services to farm operators to enhance profitability of U.S. farms and to conserve soil and water resources.

The third change is for the purpose of deleting language providing earmarked funding for the nutrition and family education program, Urban Gardening, Pest Management, Farm Safety, Pesticide Impact Assessment, Farm Financial Assistance, Rural Development Centers, Integrated Reproductive Management, and programs funded under the Renewable Resources Extension Act. Earmarked funding for these programs is not proposed in fiscal year 1987.

The fourth and seventh changes are for the purpose of deleting the floor on the level of support for Extension's Home Economics program. This provision conflicts with the primary intent of the Smith-Lever Act giving maximum flexibility to the State Cooperative Extension Services in determining programs needing attention in the respective States.

The fifth change deletes reference to transfer from Food Stamp program for EFNEP. Not proposed in FY 1987.

EXTENSION SERVICE

Appropriation Act, 1986		$344,583,000 a/
Budget Estimate, 1987		140,000,000
Decrease in Appropriation		-204,583,000
Adjustments in 1986		
Appropriations Act, 1986	$344,583,000	
Less Pro-Rata Reduction, P.L. 99-190	-1,836,000	
Net Appropriation	342,747,000	
Transfer to Departmental Administration and Office of Governmental and Public Affairs for Reimbursable Activities b/	-46,000	
Adjusted base for 1986		342,701,000
Budget Estimate, 1987		140,000,000
Decrease from adjusted 1986		-202,701,000

a/ Includes $38,627,000 transferred from the Food Stamp Program to Extension Service, pursuant to P.L. 99-190, for the Expanded Food and Nutrition Education Program (EFNEP).

b/ A transfer of $7,000 to Departmental Administration and $39,000 to Office of Governmental and Public Affairs is to fund activities previously financed on a reimbursable basis as a direct appropriation in FY 1987.

SUMMARY OF INCREASES AND DECREASES
(On basis of adjusted appropriation)

Item of Change	1986 Estimated	Program Changes	1987 Estimated
Smith-Lever Sections 3b&c	$240,035,000	-$112,488,000	$127,547,000
Smith-Lever Section 3d:			
Food and Nutrition Education.	60,224,000	-60,224,000	- -
Pest Management	7,486,000	-7,486,000	- -
Farm Safety	1,014,000	-1,014,000	- -
Pesticide Impact Assessment	1,706,000	-1,706,000	- -
Urban Gardening	3,479,000	-3,479,000	- -
Financial Management	1,491,000	-1,491,000	- -
IRM	49,000	-49,000	- -
Rural Development Centers	720,000	-720,000	- -
Renewable Resource Extension Act.	2,485,000	-2,485,000	- -
D. C. Extension	977,000	-578,000	399,000
1890 Colleges and Tuskegee University	17,635,000	-10,431,000	7,204,000
Federal Administration and Coordination	5,400,000	-550,000	4,850,000
Total, Available	342,701,000	-202,701,000	140,000,000

PROJECT STATEMENT
(On basis of appropriation)

Project	1985 Actual Amount	1985 Actual Staff Years	1986 Estimated Amount	1986 Estimated Staff Years	Increase or Decrease	1987 Estimated Amount	1987 Estimated Staff Years
I. Payments to States:							
a. Smith-Lever Act							
(1)Sections 3b & c Program	$235,242,843	--	$234,165,520	--	-108,763,152	$125,402,368	--
Set-aside for Federal Administration (4%).	5,927,440	--	5,869,480	--	-3,724,848	2,144,632	--
Subtotal, Sections 3b & c	241,170,283	--	240,035,000	--	-112,488,000(1)	127,547,000	--
(2)Section 3(d):							
Program:							
Food and Nutrition (EFNEP)	60,140,520	--	60,224,000	--	-60,224,000	--	--
Pest Management	7,531,000	--	7,486,000	--	-7,486,000	--	--
Farm Safety	1,020,000	--	1,014,000	--	-1,014,000	--	--
Pesticide Impact Assessment	1,716,000	--	1,706,000	--	-1,706,000	--	--
Urban Gardening	3,500,000	--	3,479,000	--	-3,479,000	--	--
Financial Mgmt.	1,000,000	--	1,491,000	--	-1,491,000	--	--
Integrated Reproductive Mgmt	--	--	49,000	--	-49,000	--	--
Rural Development Centers	--	--	720,000	--	-720,000	--	--
Set-aside for Federal Administration (4%).	213,480	--	--		--		
Subtotal, Section 3(d)	75,121,000		76,169,000		-76,169,000(2)	--	--
Total, payments under the Smith-Lever Act.	316,291,283	142	316,204,000	148	-188,657,000	127,547,000	--
b. Payments under Renewable Resources Extension Act	2,500,000	--	2,485,000	--	-2,485,000 (3)	--	--
c. Payments to the District of Columbia:							
Program	943,680	--	937,920		-554,880	383,040	--
Set-aside for Federal Administration (4%).	39,320		39,080		-23,120	15,960	--
Total, payments to the District of Columbia	983,000	1	977,000	1	-578,000 (4)	399,000	--
d. Payments to 1890 Colleges and Tuskegee Univ:							
Program	17,031,360	--	16,929,600		-10,013,760	6,915,840	--
Set-aside for Federal Administration (4%).	709,640	--	705,400		-417,240	288,160	--
Total, payments to 1890 Colleges and Tuskegee University	17,741,000	2	17,635,000	2	-10,431,000 (5)	7,204,000	--

Project	1985 Actual Amount	Staff Years	1986 Estimated Amount	Staff Years	Increase or Decrease	1987 Estimated Amount	Staff Years
2. Federal Administration and Coordination (Direct Appropriation)	5,839,794	27	5,400,000	27	-2,850,000	2,550,000	--
(Cost of reducing Staff)	--	--	--	--	+2,300,000	2,300,000	--
Total, Federal Administration	5,839,794	27	5,400,000	27	-550,000(6)	4,850,000	--
Unobligated balance	325,923	--	--	--	--	--	--
Total available or estimate	343,681,000	172	342,701,000	178	-202,701,000	140,000,000	91
Transfer from the Food Stamp Program	--	--	-38,627,000	--			
Transfer to Dept Adm & the Ofc of Govt & Pub Affairs	+46,000	--	+46,000	--			
Total, appropriation	343,727,000	172	304,120,000	178			

Explanation of Program

Appropriations for the Extension Service enable the U.S. Department of Agriculture to perform its partnership role with State and local counterparts to carry out cooperative Extension work for the benefit of our Nation's farmers and ranchers, and agricultural industries, rural and urban communities, families and youth, and the ultimate consumers of agricultural goods and services.

Cooperative Extension work is authorized under the Smith-Lever Act of 1914, as amended; the Rural Development Act of 1972, as amended; and the District of Columbia Public Postsecondary Education Reorganization Act. The National Agricultural Research, Extension and Teaching Policy Act Amendments of 1981 and 1985 (Title XIV of the Agriculture and Food Acts of 1981 and 1985) also authorize the Federal Government, States and counties to implement cooperative Extension programs commensurate with needs stemming from changes in U.S. agricultural practices and the world food and agricultural situation.

The Extension Service, an agency in USDA, is a legislated partner in the cooperative effort with each State, the District of Columbia, Puerto Rico, Guam, the Virgin Islands, American Samoa, the Northern Marianas, and Micronesia.

Extension work in States and counties is financed from Federal, State, county and local sources and is jointly planned with ES-USDA to provide educational programs adapted to local problems and conditions. Extension helps people identify and solve their farm, home, and community problems through use of research findings of the U.S. Department of Agriculture and the State Land-Grant colleges and universities.

JUSTIFICATION OF INCREASES/DECREASES

(1) A decrease of $112,488,000 in payments to States for formula funded programs under Section 3(c) of the Smith-Lever Act ($240,035,000 available in FY 1986

Need for Change. The Federal partner currently provides approximately 33% of the total Extension resources. This percentage has been gradually declining with State and local entities providing a greater share of funding to meet established priorities. Proposed funding levels, consistent with efforts to reduce Federal spending, will provide for continued attention to national priorities. Formula distribution allows for the maintenance of an educational outreach system in all states and territories, which can systematically assess and adapt research results for appropriate application, and respond to emerging problems, natural disasters, current crisis in agriculture, and other activities requiring national approaches. Federal funding also provides resources for the continuation of programs addressing ongoing high priority national concerns in such areas as: (1) restoration of profitability to American agriculture; (2) managing and conserving natural resources such as groundwater and highly erodible and dwindling croplands; (3) proper pesticide and chemical use and management; and (4) nutrition and diet.

Nature of Change. This proposal would reduce the Federal funding of cooperative extension programs at the Land-Grant universities by 47% from current levels. Contributions to the Extension system by the State and local partners can be directed toward priorities identified at the local level.

(2) A decrease of $76,169,000 in payments to States for specifically earmarked programs funded under Section 3(d) of the Smith-Lever Act consisting of:

(a) A decrease of $60,224,000 in the Expanded Food and Nutrition Education program (EFNEP) ($60,224,000 available in FY 1986)

(b) A decrease of $7,486,000 for the Integrated Pest Management (IPM) Program ($7,486,000 available in FY 1986)

(c) A decrease of $1,014,000 to eliminate earmarked funding for Farm Safety ($1,014,000 available in FY 1986)

(d) A decrease of $1,706,000 for the National Agricultural Pesticides Impact Assessment Program (NAPIAP) ($1,706,000 available in FY 1986)

(e) A decrease of $3,479,000 to eliminate the Urban Gardening Program ($3,479,000 available in FY 1986)

(f) A decrease of $1,491,000 to eliminate assistance to farmers for Financial Management ($1,491,000 available in FY 1986)

(g) A decrease of $49,000 for the Integrated Reproductive Management (IRM) Program ($49,000 available in FY 1986)

(h) A decrease of $720,000 for support of Regional Rural Development Centers ($720,000 available in FY 1986)

Need for Change. Programs in these specific areas have been developed with prior earmarked funds. Funding from State and local governments and private sources could be used to continue high priority aspects of these programs.

Nature of Change. This proposal will eliminate specifically earmarked funding for all programs under Section 3(d) of the Smith-Lever Act, consistent with overall Federal spending reductions.

(3) A decrease of $2,485,000 to eliminate earmarked funding for the Renewable Resources Extension Act (P.L. 95-306) ($2,485,000 available in FY 1986)

Need for Change. RREA funds have assisted State and local efforts to initiate and develop programs in forest and range conservation and utilization. These funds have stimulated additional State and local support for educational programs for small, private, non-industrial forest and range landowners. Elimination of this earmarked Federal RREA funding is being proposed in favor of non-earmarked formula funds and to assist in deficit reduction efforts.

Nature of Change. This proposal will eliminate specifically earmarked funding for this program.

(4) A decrease of $578,000 for extension programs in the District of Columbia ($977,000 available in FY 1986)

Need for Change. Significant reductions are proposed in Federal funding support to D.C. Extension consistent with reducing Federal deficits which threaten continued economic recovery. Funding from local governments, which currently accounts for approximately 59% of the total available, would permit continuation of high priority work with minimal Federal assistance.

Nature of Change. This proposal will reduce funds for D.C. Extension provided under section 209(c) of Public Law 93-471.

(5) A decrease of $10,431,000 for payments to the 1890 Colleges and Tuskegee University ($17,635,000 available in FY 1986)

Need for Change. Funding for Extension programs at colleges receiving the benefits of the second Morrill Act and Tuskegee University have been funded based on a formula percentage of total funding for Extension activities. Proposed funding levels are in line with other Extension Service requests for 1987.

Nature of Change. This proposal would reduce the Federal assistance to Extension programs at the 1890 Colleges and Tuskegee University provided for by the second Morrill Act by an estimated 59% from current levels.

(6) A net decrease of $550,000 for Federal Administration and Coordination (direct appropriation) ($5,400,000 available in FY 1986)

(a) A decrease of $2,850,000 consisting of: $2,300,000 for reduced staffing and operating Expenses; $350,000 for pilot projects on Technology Transfer; and $200,000 for pilot project on Farm and Financial Management.

Need for Change. Significant reductions in staffing and associated operating expenses are proposed in FY 1987. These reductions are proposed consistent with program changes discussed in other sections.

Technology Transfer pilot projects provided in FY 1986 are also not being recommended for continuation. The funds provided during the past several years were sufficient to complete the demonstration project.

The pilot project on farm and financial management is also not being recommended for funding in FY 1987.

Nature of Change. This proposal will eliminate funding support associated with reduced staffing and operating levels, and for special projects dealing with technology transfer and farm and financial management.

(b) An increase of $2,300,000 for lump sum payments, severance pay and other nonrecurring program termination costs.

TABLE I

APPROPRIATIONS FOR PAYMENTS TO STATES, STATE ALLOTMENTS, FY 1985 - 1987

Smith-Lever Act: Sec. 3(b) & 3(c)	FY 1985	FY 1986	Total Proposed for FY 1987
Alabama	5,287,813	5,256,086	3,377,390
Alaska	771,049	766,423	341,486
American Samoa	659,119	655,164	211,070
Arizona	1,352,481	1,344,366	680,579
Arkansas	4,444,250	4,417,583	2,751,723
California	5,370,775	5,338,550	2,975,613
Colorado	2,116,771	2,104,070	1,101,979
Connecticut	1,596,388	1,586,810	779,547
Delaware	910,012	904,552	427,063
Florida	3,117,287	3,098,583	1,582,279
Georgia	5,889,342	5,854,006	3,619,162
Guam	692,636	688,480	320,332
Hawaii	973,692	967,850	536,105
Idaho	1,905,533	1,894,100	939,098
Illinois	7,055,717	7,013,383	3,672,819
Indiana	6,338,625	6,300,593	3,202,381
Iowa	6,725,821	6,685,466	3,395,195
Kansas	3,945,894	3,922,219	2,102,539
Kentucky	6,726,785	6,686,424	3,768,968
Louisiana	3,940,616	3,916,972	2,355,314
Maine	1,597,758	1,588,171	841,545
Maryland	2,420,931	2,406,405	1,262,085
Massachusetts	1,995,730	1,983,756	1,023,149
Michigan	6,427,831	6,389,265	3,379,739
Micronesia	711,806	707,535	225,724
Minnesota	6,306,965	6,269,123	3,214,745
Mississippi	5,499,062	5,466,068	3,563,823
Missouri	6,243,384	6,205,924	3,409,580
Montana	1,787,317	1,776,593	890,205
Nebraska	3,568,009	3,546,601	1,840,610
Nevada	778,563	773,892	351,364
New Hampshire	1,135,661	1,128,847	536,415
New Jersey	1,963,030	1,951,252	994,568
New Mexico	1,455,174	1,446,443	767,874
New York	6,060,065	6,023,705	3,249,366
North Carolina	8,888,785	8,835,452	5,239,505
North Dakota	2,477,245	2,462,382	1,285,820
Ohio	7,756,375	7,709,836	4,104,187
Oklahoma	3,993,796	3,969,833	2,347,216
Oregon	2,514,399	2,499,313	1,267,224
Pennsylvania	7,579,580	7,534,103	4,093,908
Puerto Rico	5,635,199	5,601,388	3,524,856
Rhode Island	773,819	769,176	357,459
South Carolina	4,339,900	4,313,861	2,693,849
South Dakota	2,558,536	2,543,185	1,301,880
Tennessee	6,478,768	6,439,895	3,795,237
Texas	8,979,429	8,925,552	5,420,234
Utah	1,187,349	1,180,225	609,502
Vermont	1,265,693	1,258,099	624,698
Virgin Islands	674,166	670,121	308,973
Virginia	5,374,708	5,342,460	3,146,036
Washington	2,976,360	2,958,502	1,536,981
West Virginia	3,133,604	3,114,802	1,861,022
Wisconsin	6,302,233	6,264,420	3,216,706
Wyoming	1,071,815	1,065,384	519,532
Subtotal	201,733,651	200,523,249	110,946,259
3(b) Special Needs	1,544,909	1,544,909	1,544,909
3(c) Administration	5,927,440	5,882,606	2,144,632
TOTAL	209,206,000	207,950,764	114,635,800

Table IA
APPROPRIATIONS FOR PAYMENTS TO STATES
PESTICIDE IMPACT ASSESSMENT, FY 1985 - 1987

Smith-Lever Act: Section 3(d)	FY 1985	FY 1986	Total Proposed for FY 1987
Alabama	25,476	25,323	--
Alaska	8,528	8,477	--
Arizona	18,710	18,598	--
Arkansas	40,104	39,863	--
California	88,335	87,805	--
Colorado	19,778	19,659	--
Connecticut	11,387	11,319	--
Delaware	11,155	11,088	--
Florida	35,986	35,770	--
Georgia	56,499	56,160	--
Guam	8,665	8,613	--
Hawaii	11,409	11,341	--
Idaho	19,556	19,439	--
Illinois	79,949	79,469	--
Indiana	41,266	41,018	--
Iowa	76,744	76,284	--
Kansas	34,329	34,123	--
Kentucky	21,985	21,853	--
Louisiana	24,233	24,088	--
Maine	13,981	13,897	--
Maryland	17,127	17,024	--
Massachusetts	14,793	14,704	--
Michigan	33,665	33,463	--
Minnesota	51,628	51,318	--
Mississippi	40,376	40,134	--
Missouri	37,055	36,833	--
Montana	17,034	16,932	--
Nebraska	51,345	51,037	--
Nevada	9,872	9,813	--
New Hampshire	9,665	9,607	--
New Jersey	15,294	15,202	--
New Mexico	12,128	12,055	--
New York	30,538	30,355	--
North Carolina	45,990	45,714	--
North Dakota	21,338	21,210	--
Ohio	42,017	41,765	--
Oklahoma	27,810	27,643	--
Oregon	21,159	21,032	--
Pennsylvania	25,456	25,303	--
Puerto Rico	8,557	8,506	--
Rhode Island	10,575	10,512	--
South Carolina	26,672	26,512	--
South Dakota	20,266	20,144	--
Tennessee	23,877	23,734	--
Texas	78,280	77,810	--
Utah	11,776	11,705	--
Vermont	10,353	10,291	--
Virgin Islands	9,025	8,971	--
Virginia	24,058	23,914	--
Washington	27,439	27,274	--
West Virginia	11,658	11,588	--
Wisconsin	35,112	34,911	--
Wyoming	10,977	10,911	--
Subtotal	1,481,000	1,472,114	--
Special Projects	235,000	233,886	--
TOTAL	1,716,000	1,706,000	--

TABLE IB

APPROPRIATIONS FOR PAYMENTS TO STATES
FOOD AND HUMAN NUTRITION EDUCATION, FY 1985 - 1987

Smith-Lever Act: Sec. 3(d)	FY 1985	FY 1986	Total Proposed for FY 1987
Alabama	1,956,631	1,952,401	- -
Alaska	172,424	172,051	- -
American Samoa	62,928	62,793	- -
Arizona	558,415	557,208	- -
Arkansas	1,247,253	1,244,557	- -
California	3,297,362	3,290,234	- -
Colorado	553,683	552,486	- -
Connecticut	452,033	451,056	- -
Delaware	220,452	219,975	- -
Florida	2,024,223	2,019,847	- -
Georgia	2,130,168	2,125,563	- -
Guam	63,133	62,996	- -
Hawaii	256,503	255,948	- -
Idaho	290,724	290,099	- -
Illinois	2,117,108	2,112,532	- -
Indiana	1,192,193	1,189,616	- -
Iowa	893,971	892,039	- -
Kansas	688,077	686,589	- -
Kentucky	1,644,545	1,640,990	- -
Louisiana	1,855,120	1,851,110	- -
Maine	417,897	416,994	- -
Maryland	837,013	835,204	- -
Massachusetts	965,195	963,109	- -
Michigan	1,766,592	1,762,773	- -
Micronesia	69,363	69,213	- -
Minnesota	984,490	982,362	- -
Mississippi	1,692,118	1,688,460	- -
Missouri	1,537,939	1,534,614	- -
Montana	295,045	294,507	- -
Nebraska	533,949	532,795	- -
Nevada	170,612	170,243	- -
New Hampshire	236,923	236,411	- -
New Jersey	1,065,758	1,063,454	- -
New Mexico	505,233	504,141	- -
New York	3,386,397	3,379,077	- -
North Carolina	2,492,759	2,487,371	- -
North Dakota	341,215	340,477	- -
Ohio	2,174,850	2,170,149	- -
Oklahoma	1,041,853	1,039,601	- -
Oregon	490,714	489,653	- -
Pennsylvania	2,670,088	2,664,316	- -
Puerto Rico	1,428,231	1,425,144	- -
Rhode Island	300,990	300,339	- -
South Carolina	1,506,646	1,503,389	- -
South Dakota	385,282	384,449	- -
Tennessee	1,955,426	1,951,199	- -
Texas	4,160,365	4,151,372	- -
Utah	306,858	306,195	- -
Vermont	233,064	232,560	- -
Virgin Islands	61,990	61,856	- -
Virginia	1,670,540	1,666,929	- -
Washington	675,405	673,945	- -
West Virginia	965,826	963,738	- -
Wisconsin	949,499	947,447	- -
Wyoming	187,449	187,044	- -
Subtotal	60,140,520	60,010,520	- -
Federal Administration	213,480	213,480	- -
TOTAL	60,354,000	60,224,000	- -

TABLE IC
APPROPRIATIONS FOR PAYMENTS TO THE 1890 LAND-GRANT COLLEGES
AND TUSKEGEE UNIVERSITY, FY 1985 - 1987

Food and Agr'l Act: Section 1444	FY 1985	FY 1986	Total Proposed for FY 1987
ALABAMA:			
Alabama A&M University	930,583	925,027	374,946
Tuskegee University	930,583	925,027	374,946
ARKANSAS:			
Univ. of Arkansas at Pine Bluff	828,576	823,620	332,155
DELAWARE:			
Delaware State College	307,319	305,487	108,096
FLORIDA:			
Florida A&M University	746,553	742,096	291,762
GEORGIA:			
Fort Valley State College	1,086,159	1,079,667	429,373
KENTUCKY:			
Kentucky State University	1,348,741	1,340,682	565,680
LOUISIANA:			
Southern Univ. and A&M College	773,654	769,034	315,276
MARYLAND:			
Univ. of Maryland Eastern Shore	592,560	589,019	237,293
MISSISSIPPI:			
Alcorn State University	944,162	938,524	392,524
MISSOURI:			
Linclon University	1,321,161	1,313,265	532,001
NORTH CAROLINA:			
North Carolina A&T State Univ.	1,664,908	1,654,956	705,401
OKLAHOMA:			
Langston University	803,369	798,566	316,990
SOUTH CAROLINA:			
South Carolina State College	820,517	815,612	327,660
TENNESSEE:			
Tennessee State University	1,246,694	1,239,245	523,039
TEXAS:			
Prairie View A&M University	1,630,962	1,621,213	654,635
VIRGINIA:			
Virginia State College	1,054,859	1,048,560	434,063
Subtotal	17,031,360	16,929,600	6,915,840
Federal Administration	709,640	705,400	288,160
TOTAL	17,741,000	17,635,000	7,204,000

TABLE II

APPROPRIATION FOR PAYMENTS TO STATES

BASIS OF ALLOTMENT AND MATCHING REQUIRED, FISCAL YEAR 1987

Item	Total Estimate 1987	Allotment		Amount Paid Without Matching	Amount Required Matching
Smith-Lever Act: Section 3(b)	$127,547,000	$ 56,475,091	- Fixed by Section 3(b): by PL 87-749	$ 14,513,808	$ 41,961,283
		1,544,909	- Special need	- -	1,544,909
Section 3(c)		(56,615,800)		2,144,632	54,471,168
		21,708,467	- by farm population		
		21,708,467	- by rural population		
		11,054,234	- equally; and		
		2,144,632	- for federal administration and coordination Sec. 3(c) 1		
Retirement & Employee Compensation Cost		6,413,200	- Federal contribution to these funds	6,413,200	- -
Penalty Mail		6,498,000	- Reimbursement to the Postal Serv.	6,498,000	- -
Title XIV, Food & Agr'l Act 1977 Section 1444, as amended, 1890 Land-Grant Colleges	7,204,000	7,204,000	- 4% Federal Adm. balance paid to 1890 Colleges and Tuskegee	7,204,000	- -
D.C. Public Postsecondary Education	399,000	(399,000)			
		383,040	- to District of Columbia	- -	383,040
Reorganization Act		15,960	- for Federal Administration & Coord	15,960	- -
TOTAL	$135,150,000	$135,150,000		$ 36,789,600	$ 98,360,400

Extension Service
Geographic Breakdown of Obligations
1985 and Estimated 1986 and 1987

(Amounts in 000's)

State/Territory	FY 1985 Actual Obligations	Estimated Obligations FY 1986	FY 1987
Alabama	$ 10,365	$ 10,323	$ 4,483
Alaska	1,233	1,217	433
Arizona	2,570	2,550	899
Arkansas	7,652	7,591	3,369
California	10,062	10,022	3,258
Colorado	3,407	3,363	1,320
Connecticut	2,383	2,328	833
Delaware	1,621	1,610	574
Florida	7,215	7,104	2,204
Georgia	11,122	10,964	4,554
Hawaii	1,426	1,414	579
Idaho	2,736	2,718	1,130
Illinois	11,120	10,991	4,144
Indiana	9,006	8,787	3,565
Iowa	9,033	8,878	3,782
Kansas	5,922	5,752	2,495
Kentucky	10,982	10,879	4,747
Louisiana	8,031	7,971	3,030
Maine	2,403	2,382	922
Maryland	4,704	4,660	1,714
Massachusetts	3,485	3,466	1,109
Michigan	9,673	9,558	3,776
Minnesota	8,695	8,556	3,605
Mississippi	9,484	9,372	4,283
Missouri	10,692	10,463	4,311
Montana	2,694	2,606	1,091
Nebraska	5,237	5,014	2,121
Nevada	1,271	1,256	487
New Hampshire	1,667	1,637	601
New Jersey	3,766	3,744	1,166
New Mexico	2,518	2,448	974
New York	11,219	11,076	3,621
North Carolina	15,065	14,950	6,584
North Dakota	3,385	3,358	1,503
Ohio	11,275	11,158	4,426
Oklahoma	6,970	6,784	2,929
Oregon	3,841	3,776	1,509
Pennsylvania	11,504	11,385	4,413
Rhode Island	1,210	1,201	382
South Carolina	7,707	7,672	3,310
South Dakota	3,449	3,410	1,468
Tennessee	11,172	11,092	4,725
Texas	18,227	17,956	7,048
Utah	1,938	1,921	795
Vermont	1,802	1,746	696
Virginia	9,531	9,407	4,026
Washington	4,592	4,506	1,752
West Virginia	4,644	4,615	2,025
Wisconsin	8,747	8,608	3,611
Wyoming	1,622	1,595	637
American Samoa	279	734	217
Guam	796	796	330
No. Mariana Is.	70	70	0
Puerto Rico	7,178	7,544	3,708
Micronesia	665	799	235
Virgin Islands	709	778	320
District of Col.	944	938	383
Sub-Total	330,716	327,499	132,212
Federal Admin.	13,011	15,248	7,788
Total	$343,727	$342,747	$140,000

EXTENSION SERVICE

STATUS OF PROGRAM

Extension Service (ES) addressed primary issues of the Nation and major concerns of its diverse clientele through several program thrusts. Recent Extension efforts target the continued viability of the American farmer, family, and community during the current farm financial crisis. To this end, major programs specifically address:

- o Agricultural Profitability
  - Farm Financial Management
  - Developing Management Capabilities
  - Increasing Efficiency
  - Improving Marketing
- o Assuring Economic Health & Stability
- o Enhancing Health and Quality of Life
- o Conserving Resources

These program thrusts, funded mainly through formula funds and matching contributions from States and local entities, are complimented by other Extension programs which specifically address problems clientele face in the areas of: pest management, pesticide impact assessment, farm safety, urban gardening, food and nutrition education (EFNEP), and renewable resources management (RREA).

o AGRICULTURAL PROFITABILITY

-FARM FINANCIAL MANAGEMENT-

Current Activities

A September 1985 national survey of State Extension Services indicated that 95,600 farm families received very intensive assistance through Extension programs during the past two years which aided them in revising their farm business and financial plans. This survey also indicated that another 260,000 farm families will need this type of financial assistance in the next 12 months. Most States are planning for continued or expanded programs during the coming year as resources permit. A package of financial management computer programs known as FINPACK, developed and distributed nationally by the Minnesota Farm Financial Management Center, is being adapted by a majority of State Extension Services.

To expand and strengthen State Extension Programs, Extension Service-USDA funded 18 special projects involving 22 State Extension Services with the $1 million designated in the FY 1985 appropriations. These special projects provide intensive assistance to financially distressed farm families. This includes assistance in revising their financial and farm business plans and implementing changes to improve their financial situation. The major factors involved in selecting the projects for funding were the magnitude of the financial crisis in that State and the number of farmers targeted to quickly receive intensive assistance. Components of these projects include the cooperative involvement of FmHA and other agricultural lenders, workshops on financial management, one-on-one counseling to prepare revised financial plans, local community involvement and support, computer decisionmaking programs, counseling centers and hot lines, use of multi-media capabilities, and evaluation of program impacts.

Assistance with stress problems is also a major component of these financial management programs. Extension Service-USDA also funded a project in the North Central Region to develop educational material on stress management. These educational materials, which include videotape, slides, and educational modules, are being shared with other States across the country. Additionally, ES funded special projects in Nebraska and Texas to provide intensive assistance to financially distressed farm families; in North Dakota to train financial-stressed farmers to use interactive video-disk microcomputer technology in preparing their own cash flow projections; and in Minnesota to establish a farm financial management center which is providing financial management computer programs to other Extension Services.

Selected Examples of Recent Progress:

Minnesota Extension reached approximately 15,000 farm families during June and July of 1985 alone through existing farm financial programs and a special program--"Project Support"--which was supported with the special ES project funds. Iowa Extension's ASSIST Program (supported with ES special funds) has helped approximately 8,000 farmers thus far in analysis of options for servicing debt and cash flow. The Iowa program has worked intensively with approximately 3,500 agricultural lenders and professionals (lawyers, clergy, social workers, teachers) and 2,000 non-farm businesses and organizations to train them to work with financially distressed farmers. North Dakota Extension, since October 1983, has used a "Tools for Profit and Survival" kit in providing intensive assistance to approximately 4,500 farm families in developing farm business and financial plans. Illinois Extension has produced assistance to approximately 5,000 families in their programs which include the use of a hot line and farm financial counseling centers. North Carolina estimates that some 2,250 farmers and families have received intensive assistance in developing revised farm business and financial plans. Similar intensive assistance has been provided to an estimated 4,000 farm families in Tennessee and to 5,700 in Texas.

Michigan deployed a van with microcomputers and a team of specialists to assist 1,500 farmers in preparing cash flow projections and other financial analysis.

-DEVELOPING MANAGEMENT CAPABILITIES-

Current Activities

Extension holds many roles in helping the manager with decisionmaking. Extension may be provider, teacher, catalyst or adviser. The problem may be scientific, technical, or financial. Whatever form it takes, business people, farmers, ranchers, homeowners, homemakers, youth, government workers and organization members are turning to Extension for assistance in adapting and using electronic technology as instruments for more logical, practical, and economic solutions to complex problems. Extension programs involve various management fields including: improving farm management, pest management, business management, home management, financial management, natural resources management, and energy management.

Selected Examples of Recent Progress:

A national study of the impacts of Extension programming in financial planning and management identified beneficial effects for participants in farm management associations. A representative sample from a population

of nearly 8,000 members of farm management associations in Alabama, Indiana, Kentucky, and Michigan indicated their participation made it easier for them to cope with the present financial situation. Three-fifths of the respondents had held their net worth constant or increased it over the 1980-84 period and only 11 percent were experiencing any difficulty in obtaining credit in the Spring of 1985. Keeping good records, knowing production costs, taking advantage of tax laws and measuring financial progress were rated as being the most helpful benefits of program participation.

Extension equips farmers with the tools and skills necessary for understanding and making decisions on whether or not to use crop insurance as a risk management tool. Educational materials and recordkeeping procedures have been prepared and distributed by a national Extension committee on crop insurance. A Michigan-Minnesota special project has developed a computer program to assist farmers to determine optimum risk management strategies for four crops simultaneously considering crop insurance and marketing alternatives. Virginia is conducting a project to permit farmers to incorporate subjective probabilities of crop risks into their decisionmaking on crop insurance. Delaware and Massachusetts Extension Services have assisted the Federal Crop Insurance Corporation in the development of a crop insurance program for several vegetable crops and cranberries.

It was back to management basics--recordkeeping, financial planning and tax management during loss years--as Extension workers worked with farm families building critical management skills.

Missouri Extension Service professionals provided current information on outlook, management strategies, and budgets in a series of management meetings: 18 special seminars for 500 lenders; a 5-day intensive course for 46 agricultural lenders, and training in financial statement preparation for 42 area farm management specialists and 600 farmers. An estimated 5,000 Missouri borrowers have better information and financial management skills as a result of the work.

In another project, Georgia workers concentrated on helping farmers keep and use records. As a result of the work, 500 farmers reported making better management decisions, 250 better enterprise choices, and 125 improved credit terms.

Three-day farm management schools were held for 588 farm families in Iowa. Topics included: financial management, family living expenses, dealing with stress, farm accounting, and marketing.

Thirty-eight Washington Extension faculty committed 797 days to a farm business management and analysis project that reached 12,535 clients, with such topics as recordkeeping, preparing financial statements, applying for loans, and enterprise analysis.

Lumber manufacturing workshops in Oregon assisted firms in becoming more competitive by focusing on the most recent technology and business management practices. Programs reach managers of nearly 100 sawmills in a typical year. Approximately 10% of those reached are able to implement incremental changes which yield an average of about 2% increased lumber recovery. The value of this increased recovery is worth $5 million to the economy of Oregon.

Extension education programs are developing management capabilities throughout the aquaculture industry. Workshops, demonstrations, and a

variety of educational materials have been developed to increase management skills of fish farmers. In Mississippi, Extension staff developed computer software and held workshops to train farmers to use computer technology in fish farm management. The application of this technology is now commonplace among fish farmers in Mississippi.

Extension Community and Rural Development programs continue to make significant contributions in development of management capabilities for rural local governments. Under the auspices of the Southern Rural Development Center, researchers at Texas A&M are developing new Extension materials for training local officials on how to select and use computers. Training materials are currently being distributed in States throughout the Southern region. In Mississippi, solid waste operations are the target for management improvement. Extension held numerous solid waste studies and workshops aimed at cost cutting in collection and disposal.

The Family Community Leadership (FCL) project has trained over 3,000 volunteers to understand and become involved in public decisionmaking. The FCL effort is a Kellogg Foundation demonstration project, sponsored by the Western Rural Development Center and six western States: Alaska, Hawaii, Oregon, Colorado, New Mexico and Washington State. The success of the project has resulted in a national demand for programs. The project prepares women and other segments of the public, who traditionally are not represented, to participate in the process of formulating public policy. The combined in-kind and real dollar value of the effor is well over $2 million, half coming from the six States and the remaining shared equally between the Kellogg Foundation and volunteer contributed resources. In Alaska an Extension trained community volunteers helped locate a new school that not only met the financial limitations of the school board, but overcame the problems of distance and met the multiple needs of the rural communities served. In Oregon, the FCL trained volunteers have been called upon by such diverse groups as the Oregon Wheat League, Washington county government (urban) and the Black Women's Caucus to assist in programs to understand and resolve public policy issues.

There are very significant income tax consequences where farm losses and/or bankruptcies are concerned. In 1984, Income Tax Workbooks were coordinated and produced at the University of Illinois. An implicit goal was to help tax professionals do the best tax management job possible for their farm clients.

In examples of State tax meetings, Kansas Extension conducted 10 2-day tax seminars for 2,359 participants; Pennsylvania, 13 area meetings with 800 participants; and Georgia, meetings with 420 farm tax preparers who filed 25,300 farm tax forms.

-INCREASING EFFICIENCY-

Current Activities:

Extension programs provide farmers and agribusiness with education and information to strengthen agriculture through increased efficiencies in production, marketing, and financial management. The Cooperative Extension system is developing a total production systems approach to improve the profitability of agriculture by striving for maximum economic return -- not maximum output. Better integration of production, financial, and marketing strategies is being achieved by using the resources of a team of Extension specialists and agents working closely with research and industry counterparts.

Selected Examples of Recent Progress:

An innovative program was developed by Oklahoma. County, Area, and State specialists, key producers, feed industry, and pharmaceutical companies worked in a unified effort to bring about the use of protein supplements with an ionophore for summer stocker cattle. Producers of 200,000 stocker cattle fed 1 pound of this supplement daily to their cattle and obtained .6 lb/day increased gain over a 70-day grazing season. This amounts to 8.4 million pounds of increased gain valued at $4.6 million. Income above feed cost was $2.7 million.

Integrated software developed in Kansas is now being used in Texas, Kentucky, and Idaho to assist beef producers reduce risks through integrated management. This decisionmaking tool is being coupled with a strong demonstration effort and is helping producers accurately select profitable technologies tailored to their specific environments. This software is also being developed for wheat and corn. The National Cattlemen's Association and National Wheat Growers Association are strongly supporting this effort as a type of methodology that will result in long range stability and profitability in agriculture.

The Extension Poultry Science Riverbend Laboratory in Georgia saves the poultry industry at least $5 million annually. In addition to least-cost ration formulation, assistance is offered in the form of screening ingredients for toxic substances or pesticides, egg quality related tests, evaluation of the nutrient profile of ingredients, and problem-solving laboratory analysis. In several instances, this service has prevented the ruin of a company or enabled a company to save many thousands of dollars on ingredient purchases.

Although trichinosis is an infrequent disease of humans, the incidence is high enough to cause public concern and is a serious economic burden to the swine industry. The National Pork Producers Council (NPPC) formed a task force with a goal of a 100 percent trichina-free pork supply by 1987. The Extension Service was requested to help plan, develop, integrate, and coordinate with other agencies a strong national educational program that prevents trichina infection in hogs and eliminates human exposure. (1) a slide/tape set and fact sheet, developed in cooperation with the University of Illinois and ARS, have been distributed for use in producer and other educational programs. (2) Only 66 human cases of trichinosis were reported in 1984 as compared to the average of 100 to 150 per year cases in the last decade. (3) Work by the DOE has shown that low level irradiation of pork destroys trichina. Approval of irradiation as a method of destroying trichina has been approved by FDA. (4) Testing methods developed by ARS and FSIS have been approved and widespread testing of pork and tracebacks to the farm are being proposed. Future income potential and increased exports are very possible.

Preconditioning is the application of procedures at the farm or ranch of origin that prepares feeder calves to withstand the stresses of shipping and feedlot adaptation and to resist diseases. Extension veterinarians, animal scientists, marketing specialists, and county agents are actively involved with producers, veterinarians, cattleman's associations, and marketing organizations to promote and organize certified preconditioning for health (CPH) programs. (1) Thirteen States report CPH programs and 7 others are promoting preconditioning of feeder calves. (2) Extension is conducting educational meetings and field days. Information is being provided to the farm press and in Extension publications. (3) Extension

personnel have helped organize special sales and have closely monitored numbers marketed, marketing advantages, and results of feeding CPH cattle. (4) CPH cattle brought an additional $2-$7 per 100 pounds, gained 45-75 pounds during the 30-day postweaning period, but at additional expense for preconditioning. Ten dollars to $20 profit or more per calf can be realized. (5) The cattle feeder is a major benefactor. Mortality was reduced to 0.5 percent versus 2-4 percent in non-preconditioned cattle in one State; morbidity was reduced from 25 percent to 6 percent.

The Extension Service has cooperated with scientists, veterinarians, diagnostic laboratories, State and Federal regulatory personnel, and producer groups in achieving brucellosis program objectives. Brucellosis control is a part of Extension producer and management programs in all States. (1) Meetings, seminars, radio, television, slide cassettes, exhibits, individual consultations, and publications are being used to reach people. In Texas, 63,000 publications were distributed in 1 year.

Louisiana, distributed 10,000 publications on brucellosis. The Oklahoma Extension Service cooperated with the Kerr Foundation to produce an excellent film about eradicating brucellosis in cattle. Work has also been coordinated with APHIS. (2) In several States, county agents helped to organize county brucellosis eradication committees to develop programs. Texas directed a major effort toward 33 counties with the most quarantined herds. Louisiana held 62 educational meetings attended by 12,295 persons. Wisconsin included brucellosis in management meetings attended by 20,000 dairymen to help the State regain its brucellosis-free status. (3) The number of brucellosis quarantined herds in the Oklahoma, Texas, Louisiana, and Arkansas area decreased by 306 herds during the past year. (4) The number of newly infected brucellosis herds in the United States has dropped 14 percent in the past year.

In recent years, FSIS and ES have worked on a Residue Avoidance Program (RAP). (1) Forty-nine projects in 33 States were funded. These projects include data collection and development of information about residues and residue avoidance; computerization of this information; identifying problems and critical points of control; demonstrations to develop and evaluate management recommendations; educational models and others that are contributing to national and other State programs. (2) Most States developed educational materials, including video tapes, slide/tape shows, posters, envelope stuffers, publications, and demonstration results. Over 150 items have been produced. (3) State Extension staffs are conducting meetings with producer, industry, and animal health organizations to develop cooperation and participation. (4) Statistics compiled by FSIS show that since Extension first became involved in 1978, residue violations have been reduced by 72 percent. (5) Reduced violations will increase government efficiency, reduce costs, improve the image of the meat supply, and protect opportunities for marketing of animal products in foreign countries.

In Arkansas, because of the Extension Program and the Rice Research Verification Trials, State rice yields per acre increased by 9 percent in 1984 over 1983 from 4,265 to 4,650 pounds per acre. This represents a significant increase in production efficiency since the increase yield was obtained without increased cost. The DD50 Computerized Management Program designed to improve precision was used by 2,563 rice producers in 1984 an increase of 21 percent over 1983. Three new high yielding rice varieties released in the past 2 years were grown on 145,000 acres, adding $47 million extra income.

North Carolina reports that (1) The number of soil samples analyzed in North Carolina increased from 210,000 in 1982-83 to 230,000 in 1983-84; (2) The use of agricultural limestone increased from 460,000 tons in 1982-83 to 640,000 tons in 1983-84; and (3) The total cost of crop production was reduced from 5 to 20 percent; fertilizer use was reduced 10 to 30 percent; profitability increased 5 to 25 percent; and yields per acre increased 5 to 10 percent.

In 1985, Extension specialists at Oklahoma State University launched a revitalized soil testing program. The objective was to provide Oklahoma wheat producers with information useful in managing wheat fertility programs or improved profitability. Soil samples tested for wheat producers increased by 250 percent and represented over 1 million acres of wheat production. Oklahoma State University staff estimated the savings and extra income from improved fertilizer use at $18 million annually. Unexpectedly, a large number of soil samples were acid and required lime. Over 2 million tons of lime will be required to correct excessively acid soil conditions for profitable crop production.

Extension education programs are playing a direct role in the rapid expansion of the aquaculture industry in the Southeastern United States. Programs in the area of water quality management, fish diseases, fish nutrition, and application of computer software in fish farm management are resulting in increased productivity of existing farm acreage. Workshops for new prospective fish farmers in Mississippi have led to an orderly expansion of the acreage devoted to catfish farming. Production of farm-raised catfish has increased by approximately 17 percent over the same period a year ago and now stands at approximately 240 million pounds per year. Demonstration programs in Texas and Louisiana have led to a three-fold increases in pounds of crawfish produced per acre. The crawfish industry is now valued at over $80 million annually.

Extension provides educational leadership to firms which dry lumber through organizing and supporting State-wide and regional kiln-drying associations, and programs on the latest methods in kiln drying. The New England Kiln Drying Association and the Keystone Kiln Drying Association (Pennsylvania and New York) are only two examples of successful associations which were organized by Extension and whose members continue to receive the latest information on efficient drying methods from Extension. Reduced energy consumed in drying, reduced drying losses from degrade, and reduced turnover time (and therefore inventory cost) has led to improved efficiency in drying throughout the Nation. Workshops for kiln operators are held in Maine, Oregon, North Carolina, Tennessee, Minnesota, and Virginia. Kiln operators using the latest technology can reduce drying losses by $50 per 1000 board feed.

In Alabama, a new Forestry Extension position was jointly funded with a private forest industry for a four-county area. As a result, 50 and owners invested in forest improvement practices on 4,500 acres. The potential wood supply in the four-county area will be increased by 3.5 million cubic feet over the next 30 years, with a 3.12 to 1 benefit/cost ratio.

IMPROVING MARKETING

Current Activities

Extension marketing programs encourage producers to respond to changes in the marketplace for their products and to analyze market potential with greater

accuracy through improved outlook. In recent years, marketing of agricultural products has become sophisticated and individual producers need a greater level of knowledge about the markets and the marketing alternatives for their products. Consideration for consumers is also an important aspect, especially in the markets for fresh fruits and vegetables sold in community farmers' markets, rural markets, or direct farmer-to-consumer sales on the farm.

Home production skills and marketing procedures are being taught entrepeneurs, the low-income, and the unemployed to increase family income. Educational objectives include quality product design, marketing, distribution, exhibiting plans, and record keeping, to create a profit.

Selected Examples of Recent Progress:

The agricultural community gained the use of a new marketing tool last fall. The 1982 Futures Trading Act lifted the 50-year ban on options trading and authorized the Commodity Futures Trading Commission (CFTC) to conduct a limited test. Options enable farmers, processors, traders, and others to establish a price floor or ceiling on commodities they wish to sell or buy. They are enough different from futures contracts to require a major educational effort. Extension Service-USDA, cooperating with the CFTC and the commodity exchanges, developed an educational package and held in-service training workshops for State Extension specialists. The materials and meetings were available when interest was high. Over 500 representatives from lending, brokerage, and commodity firms, producer associations, and other interested agribusinesses attended one of four commodity-oriented conferences designed to introduce agricultural commodity options. Extension specialists, often cooperating with CFTC and commodity exchange personnel, trained producers, processors, grain elevators, and others. During the fall and winter of 1984/85, every State used the materials in some way in their Extension marketing program. Farmers and agribusinesses have developed a better understanding and positive awareness of agricultural options as a marketing and risk management tool.

Extension has improved its outlook programs by providing more information and better analyses through its Computerized Outlook Information Network (COIN) system. To facilitate marketing decisionmaking, the Extension Service now obtains reports and information from several USDA agencies and makes them available electronically to Extension specialists within hours of their release. State specialists retrieve and adapt the information to local situations and make their analyses available to farmers and others via codaphones, radio, TV, and State computerized videotext networks. They also distribute newsletters and write articles for trade papers and newspapers. Extension is now giving the viability of production and price estimates to help clientele evaluate better the risk involved in forecasting. Educational programs for Extension specialists on risk-rated decisionmaking are now underway.

The volume of foreign trade in agricultural products impacts directly on the livelihood of U.S. farmers and ranchers. Farm income is directly affected by foreign agricultural trade and international trade policy which is complex and difficult to understand. The Cooperative Extension System, under the leadership initiated by an international trade task force, has expanded its programs to create awareness and understanding of the implications of trade and trade policies on farms and agribusinesses. A televideo conference in March 1985 beamed from Oklahoma State University via satellite reached an audience of over 3,000 educators, economists, businessmen, and government officials attending 50 "downlink" sites around

the Nation. The conference on "International Trade Policy Under Scrutiny" demonstrated the effectiveness of modern visual and communication technology for educational use.

Working with 20 commercial catfish farmers, the Alabama Extension Service improved their processing and marketing practices so they increased production by 159,000 pounds and increased incomes by $198,000.

In a comprehensive program to improve productivity and marketing of small vegetable producers in Florida, producers increased pest control, improved fertilizer use, reduced production costs, and improved marketing yields by 10,250 bu. for 180 producers with an increased income of $102,500.

Working with 40 meat processing plants, specialists in Georgia secured adoption of improved utilization so an additional 20,000 pounds of meat product was recovered per year per plant contributing to a $50,000 per plant per year improvement in income.

In an effort to increase diversification, South Carolina encouraged vegetable production and marketing. Some 318 farmers planted 680 acres of vegetables that served 69,507 consumers to increase farm income earned by $719,660.

The introduction of new food processing technology had a substantial impact on the North Carolina food industry. Some 63 meat processing plant employees were trained and profitability in meat processing was increased $125,000. New seafood processing facilities attracted $7 million in capital investments and led to 325 new jobs and $130,000 in improved profits. Training of 114 people in dairy processing resulted in a $50,000 savings.

In four states (Kentucky, North Carolina, Pennsylvania, and Tennessee), more than 145,181 people were reached and $781,700 earned by following the advice offered. A marketing newsletter was sent to 40,000 Pennsylvania artists by the Extension crafts specialist. Kentucky cooperated with the State Department of Arts Marketing Program, partly in response to the high unemployment rate. In 85 Tennessee counties, construction skills were taught 27,328 people with 59 percent mastering those skills; income was extended in 66 of the counties by $264,483. A Tennessee home production survey indicates that 76 percent of Extension clientele were using the principles and practices taught in the classes and workshops.

4-H provides educational experiences in commodity marketing, economics, and cooperatives. Commodity marketing programs involve 370,450 4-H youth nationwide, and an additional 40 thousand are enrolled in marketing and cooperative education programs.

The commodity marketing program provides youth an opportunity to learn basic economics, marketing and management principles of a free marketing system, investigate the cash and futures market, and apply economic marketing and management principles to other 4-H projects and family enterprises.

In all 13 Southern States, as well as Connecticut, Indiana, Minnesota, New Hampshire, Vermont, and Wisconsin price and marketing information is provided to sellers and buyers of timber and wood products. This is invaluable to the infrequent seller of timber, who often has no idea of its value, yet does not have a sufficient volume to justify seeking

professional marketing assistance. Availability of price information stimulates investments in timber growing by demonstrating the value of good forest management practices.

Extension education programs continue to improve producer skills in marketing aquaculture products. Crawfish marketing workshops in Texas and Louisiana provide crawfish producers with up-to-date information on new strategies, trends, technologies, and innovations affecting the industry. Programs throughout the Southern United States assist catfish farmers in understanding and developing markets. Alabama, Georgia, South Carolina, North Carolina, Kentucky, and Louisiana cooperatively developed a reginal Extension demonstration center to teach trout producers how to develop marketing strategies. Success of these programs is illustrated by recent developments in aquaculture markets such as the $52 million contract signed by Church's Fried Chicken with catfish processing plants and the Bennigans restaurant chain contract for 4.5 million pounds of crawfish tail meat.

Maine, New Hampshire, and Vermont have expanded a computerized forest products marketing and information system developed in New Hampshire that provides improved marketing opportunities and better use of timber, lists all major buyers of timber, mill locations, addresses, phone numbers, key contact persons, and product specifications. To enable Extension to expand the system to include all Northern New England states, developmental costs were under written by a grant from W. K. Kellogg Foundations of Battle Creek, Michigan.

o ASSURING ECONOMIC STABILITY AND SECURITY

Current Activities:

In every state and county, Extension conducts educational programs designed to assist people and their communities--farm, rural, and urban--to gain knowledge and skills, and adopt practices promoting economic stability, even in adverse conditions, with some measure of security for the future. A variety of Extension educational programs have been directed to improving economic well-being by using available resources, acquiring greater self-sufficiency for individuals and for some, acquiring job skills. Some programs dealt with concepts and principles of economics--spending, borrowing, saving, protecting (insurance, estate planning etc.), investing and sharing (taxes, social security, etc.). Other programs focused on the efficiency, attractiveness, durability, comfort, and safety of homes. These programs are implemented through cooperation with local businesses, community organizations, and governments, and also through an extensive network of Extension trained volunteers.

Selected Examples of Recent Progress:

In most states, extending income through financial planning is the first economic priority. Through cooperation with employers in nine New Hampshire counties, information on a broad range of financial planning topics was distributed to 3,000 working women. Mississippi's debt load program taught 73,000 people to better manage their debt loads. Estate planning programs reached 15,696 people in seven states (Colorado, Indiana, Maryland, Mississippi, Missouri, North Carolina, and Oregon), with 2,000 people making changes in their estate plans.

TABLE III
SOURCES OF FUNDS ALLOTTED FOR COOPERATIVE EXTENSION WORK
For Fiscal Year Ending September 30, 1986

States	Grand Total	Total Federal Funds	Total Within States	Funds From Federal Sources				Funds From Non-Federal Sources			
				Smith-Lever Act			Renewable Res Extension Act	Section 1444 1890 Colleges	State (Est.)	County (Est.)	Non-Tax (Est.)
				Penalty Mail	Multramail	All Other					
Alabama	29,522,346	10,323,149	19,199,197	482,529	481,132	7,502,349	87,085	1,800,054	16,791,564	2,111,319	296,314
Alaska	5,931,964	1,217,756	4,714,208	43,887	78,779	1,046,585	44,005		4,564,708	- -	150,000
American Samoa	733,867	733,867	- -	15,910	- -	717,957	- -		- -	- -	- -
Arizona	8,745,886	2,549,633	6,196,236	122,409	137,918	2,248,748	40,558		5,422,292	315,571	458,372
Arkansas	21,761,744	7,591,107	14,170,637	310,208	288,563	5,913,643	78,023	823,620	12,752,879	1,271,362	146,396
California	52,288,358	10,022,175	42,266,183	438,057	61,898	9,270,005	92,255		32,519,308	6,843,751	2,903,126
Colorado	16,787,394	3,363,140	13,079,754	144,644	170,253	2,948,591	47,652		6,553,849	6,180,492	314,913
Connecticut	5,265,126	2,327,747	2,937,379	118,964	13,036	2,195,747	- -		2,605,082	- -	332,297
Delaware	2,800,039	1,609,990	1,190,049	49,504	46,822	1,208,177	- -	305,487	972,714	30,000	187,335
Florida	33,777,452	7,103,942	26,673,710	302,489	498,318	5,471,186	69,853	742,096	14,327,382	11,797,897	568,631
Georgia	47,960,332	10,964,121	37,004,261	529,654	731,284	8,533,578	93,370	1,079,667	26,971,488	7,131,564	2,901,219
Guam	1,311,731	796,161	515,570	25,138	- -	771,023	- -		515,570	- -	- -
Hawaii	4,678,817	1,414,349	3,264,468	68,638	38,010	1,307,701	- -		3,264,468	- -	- -
Idaho	7,948,498	2,717,996	5,230,502	133,754	151,734	2,383,294	49,174		3,740,900	1,500,000	9,600
Illinois	37,701,084	10,991,348	16,709,716	987,724	574,203	9,766,800	52,621		12,872,676	1,842,591	2,194,449
Indiana	29,673,904	8,786,841	11,887,063	496,648	404,396	7,843,515	42,282		3,842,018	9,995,045	1,050,000
Iowa	27,184,884	8,878,702	18,306,682	475,335	486,662	7,916,205	- -		10,944,949	7,159,907	201,826
Kansas	26,003,627	5,751,673	20,251,954	344,461	533,469	4,850,417	23,326		8,036,669	9,684,864	2,530,421
Kentucky	28,754,780	10,879,587	17,874,883	595,763	529,182	8,652,643	61,237	1,340,682	11,810,236	5,564,647	- -
Louisiana	26,670,846	7,970,816	18,700,024	387,457	525,293	6,235,732	73,300	749,034	16,068,687	612,129	18,198
Maine	5,188,222	2,382,222	2,806,000	104,522	99,748	2,122,438	59,514		2,351,000	420,000	35,000
Maryland	17,731,598	4,660,369	13,071,229	218,833	314,736	3,511,009	26,772	589,019	11,032,562	1,851,275	187,384
Massachusetts	9,890,814	3,466,483	6,424,411	192,075	21,567	3,213,945	38,836		4,778,733	1,645,678	- -
Michigan	26,075,270	9,557,553	16,517,867	493,083	480,407	8,507,687	76,376		15,488,880	1,028,787	- -
Micronesia	911,105	798,605	112,500	21,857	- -	776,748	- -		112,500	- -	- -
Minnesota	29,399,701	8,556,231	20,843,470	449,874	521,014	7,534,405	50,898		11,935,554	7,146,562	1,761,354
Mississippi	28,143,513	9,371,758	18,771,755	376,902	435,569	7,542,794	70,469	938,524	13,958,994	1,863,941	948,820
Missouri	27,262,506	10,463,327	16,799,179	473,484	445,327	8,156,796	62,960	1,313,765	12,056,197	2,905,522	1,837,460
Montana	8,780,307	2,606,014	6,174,293	128,429	135,909	2,285,666	56,068		2,360,609	2,598,963	814,721
Nebraska	18,761,423	5,014,225	13,747,198	271,980	314,386	4,406,335	21,604		7,962,835	4,768,168	1,015,195
Nevada	5,424,643	1,756,066	4,168,377	61,623	61,819	1,100,682	31,942		2,289,780	1,878,597	- -
New Hampshire	4,258,010	1,638,698	2,621,312	77,155	83,620	1,447,427	30,496		1,105,701	1,480,001	35,610
New Jersey	13,015,423	3,744,181	9,271,242	208,995	219,513	3,282,284	33,389		5,465,110	3,483,833	312,296
New Mexico	8,154,980	2,447,967	5,707,013	112,130	157,408	2,132,701	45,728		4,387,600	1,228,500	90,913
New York	47,680,586	11,075,775	31,617,811	656,192	767,579	10,066,115	83,639		8,478,769	18,911,064	6,222,990
North Carolina	46,943,670	14,950,174	31,993,496	727,189	860,264	11,618,936	88,809	1,654,956	22,351,631	9,270,000	371,865
North Dakota	10,716,026	3,357,571	7,358,455	162,829	193,297	3,001,645	- -		4,491,538	2,208,355	660,564
Ohio	30,696,743	11,157,943	19,538,800	579,709	221,450	10,302,352	54,344		9,964,800	8,994,000	580,000
Oklahoma	22,138,362	6,783,692	15,354,670	312,677	348,530	5,268,807	37,112	798,566	10,625,495	3,675,312	1,053,863
Oregon	14,877,624	3,776,054	11,101,570	207,158	298,958	3,184,176	85,762		8,045,570	2,050,000	1,106,000
Pennsylvania	22,134,788	11,384,788	10,750,000	600,148	193,744	10,508,900	81,916		6,600,000	4,150,000	- -
Puerto Rico	11,525,931	7,543,945	3,981,986	306,646	147,591	7,089,708	- -		3,007,790	- -	974,196
Rhode Island	1,918,856	1,201,255	717,601	45,613	14,981	1,140,661	- -		632,601	85,000	- -
South Carolina	23,358,279	7,871,857	15,486,372	321,767	394,611	6,073,468	66,407	815,612	15,427,372	250,000	9,000
South Dakota	8,310,834	3,410,378	4,900,455	177,897	145,328	3,087,154	- -		2,964,334	1,841,121	95,000
Tennessee	27,190,085	11,092,260	16,097,825	477,813	533,421	8,773,651	58,130	1,230,245	12,981,000	2,918,325	198,500
Texas	60,470,614	17,956,753	42,523,361	896,702	1,283,279	14,064,527	98,532	1,621,213	30,392,301	11,911,309	219,760
Utah	8,789,039	1,971,186	6,347,873	99,875	128,235	1,665,607	30,219		4,986,300	1,139,650	219,923
Vermont	4,647,151	1,746,384	2,900,767	75,644	72,386	1,573,504	24,850		2,385,847	335,080	179,970
Virgin Islands	1,252,449	778,283	474,166	21,350	5,051	751,882	- -		474,166	- -	- -
Virginia	28,327,095	9,406,988	20,920,195	439,799	666,867	7,169,481	80,193	1,048,560	22,701,895	6,218,300	- -
Washington	16,516,440	4,506,117	12,010,323	246,990	287,460	3,894,999	76,746		7,888,096	4,117,035	5,197
West Virginia	9,901,848	4,615,317	5,286,531	210,422	196,367	4,150,742	57,791		2,612,094	2,581,309	93,128
Wisconsin	32,907,956	8,607,956	24,300,000	497,070	482,439	7,563,744	64,683		14,300,000	9,300,000	700,000
Wyoming	6,872,840	1,595,056	4,677,784	74,286	106,203	1,380,901	33,666		2,901,633	1,476,151	- -
Subtotal	1,037,606,756	326,093,589	711,113,169	16,147,530	15,936,882	274,994,657	2,485,000	16,929,680	486,181,732	192,951,678	31,679,799
Unallotted	2,746,679	2,746,679 1/				2,746,679					
GRAND TOTAL	1,040,353,237	329,240,068	711,113,169	16,147,530	15,936,882	277,741,136	2,485,000	16,929,680	486,181,732	192,951,678	31,679,799
D.C. 2/	1,921,018	938,018	983,000						983,000		

1/ D.C. Public Postsecondar; Education Reorganization Act

2/ Includes $1,491 for Farm Financial Management Program, $721 for Rural Development; $485 for Special Needs Projects and $36 for 1890.

In 23 states, 485,187 people actively participated in clothing management programs to extend income; in five states, more than 2.7 million people were reached through the media. Management topics included clothing construction, wardrobe economics, clothing care, and the textile trade. In 20 states, clients estimated a net value of $6.7 million through home clothing production. In Kentucky, clientele extended income another $1.2 million repairing and recycling clothing.

Programs to increase income through development of job skills and creation of home-based businesses were mounted in 23 states. In Illinois, the Consumer Homemaking Education Program (CHEP) provided job-skills training for 143 low-income homemakers, resulting in 94 persons being placed in jobs. Extension programs in Michigan assisted 3,200 unemployed with crises management and skill retooling programs. In South Dakota, 141 people participated in workshops to explore home-based business opportunities and risk. In Alabama, 1,200 participated in similar workshops. Two hundred women in Colorado were assisted in transferring jobs. Oregon worked with clientele interested in bed-and-breakfast businesses. Indiana reached 95,000 people interested in exploring home-based business opportunities.

Mississippi and Wisconsin conducted programs to increase public understanding of the food-and-fiber-production system. Twenty-six states put special emphasis on food buying, housing, and the maintenance of resources. More than 1.08 million were reached with such education. These programs extended family income an estimated $44 million and contributed to improved health. Examples: Iowa consumers learned that many poor nutrition choices were also poor economic choices; education occurred through a point-of-purchase program in 13 stores. In Florida, similar assistance saved participating shoppers $6-10 weekly.

Furthermore, Extension home economics programs in 31 states assisted 64,702 families in dealing with family problems growing out of farm financial crises.

New York and Nebraska conducted formal evaluation surveys of regional wildlife damage control workshops conducted by a State Cooperative Extension Service in cooperation with ES, USDA and other State and Federal agencies and a comprehensive handbook on wildlife damage prevention and control developed in cooperation with EPA and ES-USDA. The participants in the workshop and purchasers of the handbook identified as estimated potential savings in time and resources amounting to almost $17 million per year. The handbook, purchased by users in all 50 States, the District of Columbia, and several foreign countries sold out necessitating a brief revision and reprint of 3,000 additional copies.

Alabama held a series of forestry investment workshops for professional foresters as a direct result of the program, was realized on a total of 99,422 acres. This increased management will generate more than $60 million of timber revenue to the state's economy. Also in Alabama 47 demonstration forests were host to 43 forestry tours for 1,717 people. Eighty-four percent of the participants reported an increase in their knowledge of good forest management practices.

Regional workshops on wildlife damage prevention and control conducted cooperatively by Cooperation Extension in California, the Great Plains and the Eastern United States have helped provide professional "in-service training." These educational products and programs enable landowners and managers Nationwide to significantly reduce millions of dollars of losses to crops, timber, livestock, orchards, related properties as well as

disease hazards to humans and domestic animals caused by problem wildlife species. Concurrently, they help landowners improve habitat management for preferred wildlife species as well as productivity and total farm and ranch profitability.

Extension taught over 12 thousand Texas homeowners how to make economical use of wood in remodeling, repairs, and home heating. A representative sample of 336 of the participants saved $36 thousand as a result of the educational program.

In North Dakota, Extension developed an economic development program to aid communities in determining potential future economic development opportunities as well as how to retain and/or expanding existing businesses. Extension also assisted several communities in forming local development corporations. The Vermont Small Business Development Center counseling program resulted in 30 farmers forming a new corporation to purchase and operate a feedmill which was going out of business. The Business Management Program in Georgia helps communities learn how to estimate the dollar loss due to local consumers shopping in other trade areas and provides businesses with information and technical assistance to revitalize downtown areas.

In North Carolina more than 100 programs, tours and workshops were conducted for 5,000 landowners. This Group has an average ownership of 218 acres for a potential impact on over 1 million acres. Follow-up surveys indicated that program participants saved money on income and property taxes, received higher stumpage prices, and increase potential income by $10.2 million through practicing improved forest management.

o ENHANCING HEALTH AND QUALITY OF LIFE

Current Activities:

Extension is recognized as an authoritative source of human nutrition, food safety, and home food preservation information and technology. In many areas of the country, the local Extension office is the only source of reliable and research-based information relating to food and human nutrition. This information helps people make informed decisions on how to maintain good health and how to do so in a safe cost-effective manner.

Of the 15 million people Extension reaches with food, nutrition, and health information, 5.4 million actively participate through group or individual education (meetings, classes, consultations). Of the 5.4 million, about 16 percent learn about food economics, 33 percent learn about safe food preparation and preservation, 23 percent learn about nutrition, and 14 percent learn about health. The other 14 percent are enrolled in the Expanded Food and Nutrition Education Program (EFNEP) and receive a mix of these messages.

The Extension Service is the lead agency for USDA's campaign on Food and Fitness. All states promote Food and Fitness activities, often in cooperation with health professionals, health organizations, and fitness groups, to raise public awareness and sensitivity to safe food and to stress the interrelationships of diet, exercise, and health.

Family strength programs reached over 6 million families and 4-H youth. Over 1 million participated in direct contact programs and another 5 million were reached through mass media contacts. Special targeted audiences included

economically stressed farm families, teenage parents, single parents, step-parents, and latchkey children.

Selected Examples of Recent Progress:

Alabama focused mainly on food safety: consumers evaluating additives, ingredient labeling, and food misinformation. Alabama taught clientele through traditional Extension methods: 23,600 people through meetings; 24,000 through publications distribution; 120,126 through exhibit displays; and 123,000 through newsletters. Alabama taught another thrust, nutrition and athletic performance, through information sessions with 1,000 high school coaches and through county Dancerobics programs and weight reduction/fitness camps.

Indiana taught 18,000 people directly about economic food-buying practices and nutritional meal preparation, saving families $10 per week. The mass media coordinated with this program extending these messages to an estimated 2 million people.

Iowa incorporated Food and Fitness contests into newsletters reaching 130,000. Over 300 newspaper articles carried the Food and Fitness messages. Thirty special exhibits, fairs or displays promoted Food and Fitness objectives. Radio and television air time, 1500 minutes, featured Food and Fitness. Meetings, 380 of them, reached over 12,000 Iowans, while 450 presentations were made to community groups, reaching an additional 12,000 people. Over 80 local or state agencies and organizations cooperated through Extension with these activities.

North Carolina food buying programs for 11,077 people resulted in a yearly income extension of $252,396. Food preservation skills used by 10,241 families resulted in an average savings of $154 with the preservation of $1,577,144 worth of food. Furthermore, 24,502 other people changed eating habits consistent in some respect with the USDA/HHS Dietary Guidelines; 27,490 others changed some food-choice practices. Nearly 4,000 adults and youth gained some awareness of the relationship between substance abuse and nutrition.

Many state nutrition and health staffs work closely with the Healthy Mothers, Healthy Babies State Coordinators, promoting healthy behavior for women in an effort to reduce infant mortality and morbidity. The states most active are Georgia, Kansas, New York, North Carolina, Ohio, and South Carolina. For example: Ohio taught 12,332 new mothers and pregnant teenagers through a newsletter series and Georgia made educational contacts with approximately 185,000 through newspaper articles and other mass media.

Of 23 states providing health education, wellness messages delivered by Cooperative Extension health staff reached 656,688. Networking with other agencies extended the wellness programs. Cooperators included university medical centers, American Red Cross, Arthritis Foundation, Public Health Department, March of Dimes Foundation, Health Maintenance Organizations, Extension Homemaker Club members, Safety Councils, the Food and Drug Administration, Poison Control Centers, Senior Centers, the Consumer Product Safety Commission, and the Department of Transportation. A cooperative effort in West Virginia reached 28,000 persons, youth to elderly, with healthy-lifestyle messages about exercise, drug and alcohol abuse, home and motor vehicle safety, and health services and community resources.

Health screening helped another 35,954 persons. For example, Alabama health fairs in four counties helped 1,654 people monitor their health and reduced their medical costs $98,000. Other Extension health education programs covered prenatal care, substance abuse, and health and quackery warnings. These programs reached an additional audience of 85,029.

More than 80,000 families learned to identify the most frequent sources of stress and effective ways to prevent or cope with stress overload. In Indiana, 11,323 participated in programs designed to help them better manage stress overload; Kentucky had 13,667 people participate in stress management programs, with 92 percent indicating that there should be continued tax support for such programs. Iowa, a state hit hard by the farm crisis, assisted 15,000 people with stress problems.

The greatest number of educational programs were in parent education with over two million participants. A sampling of child care providers indicated that 90 percent adopted practices to enhance the quality of child care. Over 80,000 families and 4-H youth participated in stress management workshops; with 80 percent indicated they gained a new understanding of what they could do to cope with stress.

Pennsylvania developed an integrated approach that combined a drinking water quality program with the Chesapeake Bay clean-up program. This effort helped address the problems of nitrate contamination in well water and, at the same time, improve the water quality of the lower Susquehanna River. The results of this program could ultimately improve the health and quality of life for over 4 million people.

Kansas towns and communities have an invested value of $963 million in 1.15 million acres of community forests. Seventy-five of the state's 628 communities have organized tree management programs as a result of Extension programs. Collectively these communities manage 137,340 acres of community forests with a tree value of $114 million. Thirty-one Kansas communities earned the National Arbor Day Foundations "Tree City USA" award this year. Homeowners realize an average increase in property value of from 15 to 20 percent and save a conservative 17 percent on year-round energy requirements from a well-designed and managed community forest environment.

Latchkey children, children who are on their own from the time school ends until parents get home from work, were the focus of programs in several states. The goal of 4-H programs is to teach these youngsters what they can do to use their time in safe productive ways, and to help them prepare nutritious snacks and meals.

Youth express concern about careers and need and want jobs to provide both experience and be helpful in applying for college. In Connecticut, 1,519 youths enrolled in career exploration projects in their clubs or through seven county programs, which gave them awareness of various careers. In Fairfield County, 43 teens completed a workshop in careers in agriculture and natural resources and they then could identify sources of career information. In New Haven County 27 teens "shadowed" 29 adults from a variety of careers in a day-long program designed to give participants in-depth experiences. fifteen teens enrolled in a Learn to Earn Program, which focused on: Child care, food service, and supermarket training. The teens were from low-income families. Following the program, 14 teens did get jobs. Pre-versus post-test results indicated increased career awareness.

o CONSERVING RESOURCES

Current Activities

Extension natural resource programs emphasize land, plant and animal management and development of forest, range and crop land products. Proper management of forests, wildlife, and rangeland improves the national natural resources base, reduces soil erosion and pollution, and provides market and non-market benefits from multiple use resoures management. Educational programs in this area are designed to: (1) Help communities and individuals manage and protect soil, water, forests, rangeland, farmland, shoreline, and marine resources. (2) Encourage use of minimum tillage farming to save energy as well as to protect the long-term productivity of the soil and to reduce erosion. (3) Protect the soil while producing wood, forage, wildlife, habitat, recreation and other products. (4) Increase wise utilization of wood and solar energy for home heating and industry as an alternative to non-renewable fossil fuels. (5) Encourage energy conservation.

Selected Examples of Recent Progress

Conservation of soil and water resources is a major concern of Ohio citizens. Four million acres of Ohio cropland need drainage improvements and 2.5 million acres need erosion control measures. Twenty-five percent of Ohio citizens obtain home water supplies from private sources such as wells, cisterns, springs and ponds. Many such sources are unsafe due to improper location or construction.

Conservation and no tillage practices have been emphasized in educational meetings and demonstrations as a way to reduce soil erosion and improve runoff water quality. An audience of over 32,000 in 39 counties increased their knowledge of these practices. State conservation camp, project books, and related programs directed to 4-H audiences helped youth develop an understanding of these conservation practices. They then share with their families, clubs, and communities what they learned. Acres impacted were 3,239,142 in 88 Ohio counties.

A comprehensive multi-agency, multi-State, wood utilization effort has expanded the potential use of underutilized hardwoods in building construction. Increased utilization is now possible for aspen and soft maple in the Lake States, yellow poplar in the South and Mid-Atlantic, and alder in the West. The USDA Forest Products Laboratory research results overcame the problem of grade certification, drying defects, and crooked lumber and to make this increase in use possible. Several industry awareness programs demonstrated the hardwoods' production and uses these programs involved Soil Conservation Service RC&D, Forest Service, State Forestry Organizations, and Extension Service in Wisconsin; and Forest Service, Extension Service, and Hardwood Research Council in North Carolina. Video-tapes were used to demonstrate that the products can serve as excellent substitutes for traditional softwood framing lumber. North Carolina published technical information and made copies available to other state Extension Services to enable them to conduct their own educational programs. In addition to providing improved markets for timber, the industry expansion involved in producing hardwood framing lumber adds both jobs and additional local income.

California initiated a comprehensive educational project to help landowners improve fisheries and wildlife management, soil and water conservation, forest, production, and outdoor recreational opportunities on over one million acres of land. Texas initiated a total ranch

management educational program, involving range, wildlife, agricultural economists, and foresters, targeted at maximizing total ranch profitability on several million acres. Such efforts in these and other states helped conserve and improve millions of acres of wildlife habitat while increasing incomes for landowners and increasing access for users.

Conservation tillage has proven to be one of the most cost effective methods for soil erosion control. It has also demonstrated the effectiveness of interagency cooperation between Cooperative Extension Service, Soil Conservation Service, Agricultural Stabilization and Conservation Service, Soil Conservation Districts, and other agencies. Some outstanding success stories in conservation tillage resulted in Kentucky and Ohio. An additional success story is the "T" by 2000 Program in Illinois.

Kansas and Nebraska are cooperating in the "Prairie Tree Project." This program teaches proper windbreak management and stimulates planting of new windbreaks for multiple-purpose management. Educational efforts provide a greater awareness of the benefits of windbreaks and the proper ways to design, plant, and care for them. The annual impact of a farmstead windbreak is estimated at over $200 in savings in home heating costs, a 2% savings in a calf crop, a $10 savings in feed per head in a feedlot, and over 200 pounds savings per head in milk production.

Virginia conducted workshops, short courses, field days, bus tours, and demonstrations on forestry and management, wood products and wood processing, wildlife and fisheries management, and natural resources. These technology transfer efforts reached over 17,597 adults and 27,892 4-H youth.

Delaware used a multidisciplinary approach to address environmental issues in that state. As a direct result of these programs, the Delaware Legislature appropriated an additional $150,000 to treat critical soil erosion areas. The estimated benefits to the people of Delaware is $1.5 million saved through reduced soil loss.

Decisionmaking reached more than 39.5 million people in 1984. decisionmaking information in the energy and home environment areas. Resources were extended by $37.2 million plus an additional annual savings of $1.6 million reported through reduced energy use. Some state examples follow:

Arkansas: Home improvement projects resulted in an estimated increased net value of $2.1 million. Do-it-yourself home maintenance extended family income an estimated $198,000. As a result of adopting energy-saving practices, annual utility costs were reduced by an estimated $310,000.

North Carolina: Programs reached 32,259 families with energy conservation strategies through improved energy management skills, use of auxiliary heating devices, and energy saving window treatments. Some 25,438 families and youth implemented energy conservation measures in existing homes and gained knowledge of passive solar retrofit. North Carolina assisted another 34,200 families in building or selecting of new homes with energy-saving features. In New York, 5 million households learned repair skills, saving $500,000 in home repairs and an annual savings in energy costs of $500,000.

Nationwide, an increased emphasis on educational programs for 4-H fish and wildlife projects increased enrollment by almost 10 percent per year during the last 5 years, from 145,797 to 258,853. It is expected that

acquiring and maintaining full sponsorship for a national awards program will contribute to even further growth in wildlife and fisheries projects in the future. In addition to their own learning experiences, the hundreds of thousands of 4-H members and adult volunteers who participate in these and related natural resources management 4-H programs have positive influences both educationally and physically on millions of parents, landowners, and managers nationwide to improve the conservation and management of natural resources. These educational programs have significant and long-lasting benefits through: reduced soil erosion; improved stream and pond water quality and fishing; increased fish and wildlife productivity; improved forest management; reduced losses from pest wildlife species; and a large cadre of future leaders, managers, decisionmakers, and voters who recognize that wise stewardship of the nation's natural resource base is vital to ensure the future productivity of food, fiber, and a healthy quality of life for all Americans.

EXPANDED FOOD AND NUTRITION EDUCATION PROGRAM (EFNEP)

Current Activities:

The Expanded Food and Nutrition Education Program (EFNEP), implemented in 1968 by USDA and the state Cooperative Extension Services, has provided nutrition education to more than 2.4 million low-income families representing 9.9 million family members. Since 1970, 6.2 million youth, mainly from urban areas, participated in the program.

The targeted audience in the 802 program sites are homemakers with young children, and 4-H age youth. Currently, 4,069 employed program aides assisted by 53,532 volunteers, all trained by Extension professionals, reach adult homemakers and youth. EFNEP homemakers learn among other things to improve their diets by increasing their consumption of milk products, fruits, and vegetables. The effectiveness of this program is best described by several types of changed behaviors:

Changes in food buying and food economic behavior:

Families can extend food stamps and money for the entire month and do not as frequently run out before the end of the month.

Program families develop skills that eventually lead to employment.

Changes in physical health, diet and nutrition practices:

Food consumption practices are changed as a result of program participation. The greatest changes are in increased consumption of milk and fruits and vegetables. After participating in the program, more participants have balanced diets from the four food groups.

Homemakers participating in EFNEP show a general improvement in dietary practices. Homemakers who did not cook for themselves or the family now cook! As a result, family members lose weight and reduce health risks, e.g., high blood pressure.

When a program assistant asked homemakers to try three days with and three days without breakfast, homemakers saw the difference. Later one homemaker voluntarily invited homemakers to her home for nutrition lessons. The homemaker later became a program assistant.

Pregnant and nursing women change food habits so babies are healthier.

Changes in self concept and emotional well being:

Program homemakers refer friends and relatives as participants in the program. Small group meetings are a primary mechanism for developing networks which ultimately change self concept and self sufficiency.

After enrolling in EFNEP, program homemakers often become 4-H volunteers. Numerous club members go on to participate in other projects and further success.

Parent-child relations are cemented through participation in the program. Adults teach children and children teach adults about nutrition. Each develops respect for the ability of others.

Selected Examples of Recent Progress:

In fiscal year 1984, more than 235,194 low-income families enrolled in the in-depth nutrition education program and 454,847 youth participated in various nutrition education experiences.

Adult Examples:

Vermont: Delivery methods were revised to extend available resources. Families with telephones were reached with intermittent one-to-one and small group visits complemented by mailed lessons and further telephone follow-up and instruction. The use of these methods has resulted in a 13 percent increase in the number of families reached.

Colorado: Innovative delivery methods include the Teletips program. Teletips are recorded messages written specifically for use by EFNEP homemakers. Aides supplemented lessons by asking homemakers to dial for a prepared telephone message--a specific topic coordinated with their needs and with a recently taught lesson.

Wisconsin: A cable TV series was used to supplement and reinforce nutrition concepts with EFNEP homemakers enrolled in the program for six months or less. The series "Good Food on a Shoestring" included six 24-minute television programs about nutritious, inexpensive meals and snacks. Each program covered a different nutritious topic: Snacks for Health, New Foods - New Recipes, Compare and Save, Balanced Meals with Appeal, Meatless Main Dishes, and Key Vegetables. Wisconsin developed the series to test the effectiveness of using cable television in teaching nutrition to a low-income audience, to provide parent/child interaction information, and to enroll and reach more families. Home study materials were also used.

Florida: Forty percent of the families receiving EFNEP instruction were converted from one-on-one instruction to group instruction. This change in program delivery increased cost-effectiveness by permitting larger recruitment of clientele.

New York: An extensive training program for 235 EFNEP paraprofessionals, and 48 supervisory home economics agents was implemented on the subject of breastfeeding. New York homemakers provided information to low income homemakers to help them to make an informative choice on whether or not to breastfeed.

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Youth Examples:

Georgia: 4-H EFNEP was conducted in 21 counties. Trained paraprofessionals and volunteers taught youth in groups and in 4-H Food and Nutrition Project Clubs. A total of 1,626 volunteers from EFNEP families, community centers, schools and agencies contributed 13,410 hours in teaching and supporting the program. Fifty-nine percent of the volunteers were from EFNEP families. Ninety-eight percent of the 514 clubs followed a pre-determined food and nutrition curriculum.

Indiana: A new 5-day lesson series for youth was developed. Lesson topics included basic nutrition, specific information on the basic four food groups, relationship between food intake and physical fitness, and importance of a good breakfast. A pre test/post test used at selected sites evaluated whether EFNEP youth could name the basic four food groups and how many servings they need daily; 80 percent of those tested met the objective.

INTEGRATED PEST MANAGEMENT

Current Activities:

The Integrated Pest Management (IPM) program provides a rational pest control approach that reduces costs and protects the environment. Most programs are targeted for the insects, weeds, vertebrates, diseases, and other crop pests. Some focus on livestock and poultry, urban pests, or post-harvest agricultural products.

All state Extension Services conduct IPM programs. In addition, 11 states in the cotton belt conduct Cotton Pest Management programs using specially earmarked funds. Some of the programs have reached a level of maturity that allows them to evolve into Integrated Crop Management programs. Others continue to develop with pest ecology as a main focus.

In many cases, farmers are the audience of the educational IPM programs, but to an increasing extent, agricultural consultants and other extenders of information are becoming Extension IPM clientele.

Selected Examples of Recent Progress:

The IPM concept has been widely embraced. Conservation groups, agrichemical manufacturers, and farmers have begun to promote and adopt IPM practices. Approximately 25 percent of the U.S. crop acreage is in an organized IPM program. Almost all of America's agricultural production incorporates some IPM concepts and practices.

Results of IPM programs include the avoidance of pesticide resistance and minimization of pesticidal contamination of water or other natural resources. These parameters, along with increased farm worker safety, protection of wildlife, and effects on pesticide levels in food, are difficult to quantify.

Good data are available, however, for many of the economic benefits of IPM. Some of these data for 1984 include:

In Alabama, IPM reduced production costs in pecans by $1.9 million, increased income for cotton farmers by $24.6 million, and reduced production costs for peanut growers by $1.2 million.

In Mississippi, the IPM program in soybeans saved pesticide costs and increased production to generate increased income of $1.6 million on 72,000 participating acres.

Insecticide and fungicide costs were reduced in several states which had fruit IPM programs --

Maine	$20/acre
New York	$27/acre
Utah	$60/acre
West Virginia	$30-46/acre

In the heartland of the U.S., the IPM program has allowed farmers to respond effectively to the pest situations that they and their crops face.

In Illinois, timely spraying prevented corn borer losses on 135,000 acres.

In Indiana, "insurance treatment" for soil insects was reduced by 15 percent.

In Nebraska, $12-30 per acre was saved on 210,000 acres of corn in the west-central part of the state; in the northeast, more economical pest control was employed on 400,000 acres of corn.

Altogether, 20 states reported that the IPM program helped farmers reduce costs of production by over $23 million in 1984. This approach to profitability is an important way for agriculture to emerge from the financial crisis.

PESTICIDE IMPACT ASSESSMENT

Current Activities:

The Pesticide Impact Assessment Program (PIA) continues to provide the most objective and accurate data available for defining and evaluating benefits and risks of selected pesticides having critical agricultural and forestry uses. The Environmental Protection Agency (EPA) is evaluating these pesticides for possible use restrictions.

Through the USDA/State National Agricultural Pesticide Impact Assessment Program (NAPIAP), an assessment of fumigants has been initiated. The major commodity areas include crops associated with soil fumigation, post-harvest stored grain, post-harvest fruits, nuts and vegetables, apiculture, structural pest control, and quarantine practices. This work now underway will address the benefit-use aspects of the liquid fumigants coming under special review (RPAR) for continued registration.

Other NAPIAP assessment team activities are related to benefit-use studies of the approximately 500 pesticide chemicals going through the reregistration review in the next several years. It is estimated that one chemical out of every four or five will result in a special review.

In addition to the individual pesticide assessments, the NAPIAP must also maintain a focus on the other regulatory issues. Among these are ground water contamination, direct and indirect exposure to pesticide applicators and the public, waste disposal including containers, and pesticide drift. Other areas of concern include: endangered species, aerial transport, comparative efficacy, and application technology.

Selected Examples of Recent Progress:

Pesticide information is now being assessed on a commodity basis to provide a more comprehensive data base for evaluating the benefits and risks associated with pesticide use. This cooperative federal/state project includes analyzing data on all the pesticides, pests, and cropping practices for a commodity rather than assessing one chemical individually. Pesticide assessment by commodity has been completed on corn and soybean nationwide and on grapes in the Northeast. Resulting from EPA's use of the data, they have asked the NAPIAP to conduct pesticide assessment on eight other major commodities.

More intensive studies have been directed to retention of use of compound 1080 for predator control, and strychnine for prairie dog and pocket gopher control.

PIA reports resulting from federal/state inputs have substantially changed the EPA's regulatory position as originally proposed on some pesticides. The EPA has determined the risks associated with the use of these pesticides are exceeded by the benefits of their use and have been returned to registration. Comments and recommendations are explained in the EPA's regulatory position documents.

URBAN GARDENING PROGRAM

Current Activities:

The FY 85 Urban Gardening Program was expanded to 21 cities from the 16 in FY 84. The "new" cities and the levels of funding are: Phoenix, AZ ($112,500); Indianapolis, IN ($112,500); Denver, CO ($100,000); Seattle, WA ($100,000); and Bridgeport, CT ($75,000). Total funding for the program was $3.5 million in FY 85. The program teaches gardening skills and produce utilization and preservation to low-income inner city dwellers in some of the Nation's largest population centers. In FY 84, the 16-city program had a total of 186,000 participants. A staff of 171 conducted the program with help from about 2,300 volunteers. These city farmers worked an area equivalent to over 670 acres from which about $20 million in produce was harvested. The program also receives about $1 million in in-kind and other contributions.

Selected Examples of Recent Progress:

Jacksonville's Urban Gardening Program almost doubled the number of community gardens from 42 to 80. Of the 38 new gardens, 26 were in schools; thus, giving school-aged children the experience and opportunity to learn to grow crops and use them. Through these youth, the program also reaches parents and other family members. The estimated value of produce in this city's program was $2,742,000 in FY 84.

Philadelphia's program receives almost twice as much from in-kind and other contributions as it does from USDA for the program. Jointly with the Urban Gardening Program, the Philadelphia staff has introduced innovative techniques in gardening--raised beds, water collection--and in other food-producing activities, such as fruit growing and fish farming.

Bridgeport is one of the "new" cities added to the program in FY 85. Preliminary data show that for every $1 of the $75,000 in USDA funds, the program participants received almost $3 in produce. Over 90 percent of

the program participants are minorities and low income urban dwellers. Since this is the first year for this city program which started in late spring, it is anticipated that its dedicated staff will make this small program one of the more successful ones in the country.

FARM SAFETY

Current Activities

Farming and ranching fatalities have declined from 2,300 fatalities in 1971 to 1,600 fatalities in 1984. Injuries were reduced from 200,000 per year to 170,000 per year. There was an 11 percent decline in deaths from 1983-84. In addition, deaths per 100,000 employees declined from 52 deaths per year to 46. This compared to 60 per 100,000 for mining and 39 per 100,000 for construction. At this time, mining rates first in deaths, agriculture second, and construction third.

Selected Examples of Recent Progress:

Delaware has built up a good safety program over the last 10 years. The accident rate per million work hours for all age groups is 15.10. There has been a steady decline since 1977. The accident rate for the 15-24 age group has dropped 50 percent during that time period. This can be credited to work with the 4-H and FFA organizations. Respiratory and health programs have been initiated in line with the national trend. This included training for 3,000 pesticide operators. Agribusinesses were motivated to sell respiratory equipment. For the first time in history, applicators are making use of respiratory equipment.

California has had considerable success in working with the compensation insurance groups. A key example was a $15,000,000 dividend for 1 year for one carrier. A 7-year total returned to one agricultural worker's compensation insurance group was $72,000,000. One corporate firm pays 5 cents per hour extra for every hour a worker works without an accident. This costs them about $20,000 per year. Their premium dividend ranges between $70,000 and $80,000 yearly. For one 10-month period, there were 8 minor accidents for 200 employees. The Extension safety specialist was heavily involved in this program.

Texas ranch fatality data for the 1979-83 period shows a 30 percent reduction from the base period of 1971-75. Deaths went from an average of 192 down to 118 deaths per year. A similar reduction in injuries was assumed to have a cost saving of $74,000,000 (estimated lost earnings) and $3,700,000 medical costs. Interestingly, there are 5 FTE's being generated by the $20,000 federal funding and the state allocation.

Indiana is involved in two projects, one on power take-off accidents and the other on helping the handicapped. Inspection of 850 tractors showed the master shield had been removed. This information was used by one major manufacturer in training their 4,000 dealers with retrofitting and bringing old equipment up to safety standards consistent with the "state-of-the-art."

Montana has shown a 9 percent reduction in tractor accidents, as a result of 1-day workshops for 4-H, FFA, and entire farm families. Overall, 2,614 individuals were reached. As a result of the teaching, youths, ages 14

and 15, qualified for employment on farms and ranches. This employment earned the youths $1,680 for summer employment. This was calculated on a 60-day working season at $3.50 per hour for an 8-hour day.

RENEWABLE RESOURCES EXTENSION ACT (RREA)

Current Activities

Forty-three states planned and implemented expanded natural resources programs with the FY 1985 Renewable Resources Extension Act appropriation of $2.5 million. The expansion occurred in six program areas. In the aggregate 51.2 percent of the funds were directed towards forestland management; 17.2 percent in harvesting, marketing and processing of wood products; 14.9 percent in rangeland management; 11.5 percent in fish and wildlife management; 2.1 percent in outdoor recreation, and 3.1 percent in environmental management and public policy program areas. States utilized different strategies in addressing their natural resource issues and needs for expanded programs. Some states chose to place a major emphasis in one program area while others chose to expand or implement new efforts in a number of program areas. Several states plan a coordinated interdisciplinary expansion of programs. In total, 36 States either expanded current program efforts or implemented new programs in forestland management, 24 in harvesting, marketing, and processing of wood products, 17 in rangeland management, 19 in fish and wildlife management, 7 in outdoor recreation, and 10 in environmental management and public policy.

Forestland Management

- The primary audience is private non-industrial forest landowners.
- The emphasis of programs is on improving the productivity of forestlands.
- A majority of the programs also include a significant emphasis on multiple use management.

Harvesting, Processing, and Marketing of Wood Products

- Primary wood processors and private non-industrial forest landowners are the primary audience.
- The emphasis of programs for primary wood processors is the transfer of new technology that will result in increased profitability.
- The focus of programs for private non-industrial forestland owners is improving their marketing skills and understanding how to market their timber and associated resources.

Rangeland Management

- Ranch owners, managers, and associated professionals are the primary target audience.
- Programs will emphasize management practices and systems, alternative grazing systems, and the evaluation of the cost-effectiveness of alternative practices that improve range condition and enterprise profitability.

These limited resources have provided individual states with both the direct and indirect ability to expand current and implement new natural resource programs. Examples of the direct effect are presented below. The indirect effect is the impetus that these resources have provided to leverage other sources of funds. This has been achieved through redirection of resources from other program efforts and matching funds. A number of states have used RREA resources to secure matching funds from other federal and state agencies and private organizations for cooperative and joint programs. In addition, the entire RREA process has served to focus attention nationally and at the state level on natural resource issues and programs. In FY 1981, prior to a RREA appropriation, the Cooperative Extension System devoted approximately 388 staff years to natural resources programming. The total staff years estimated for FY 1985 (including RREA funds) is 573.

Selected Examples of Recent Programs

Georgia's greatest forestry needis to regenerate desirable forest stands. A program directed at landowners and county extension agents provided more than 2,500 participants with information regarding forest regeneration through a variety of educational approaches including a pocket slide calculator to assist landowners in analyzing reforestation investments. Last year, more than 370,488 acres were planted to pine in Georgia, surpassing the previous record set in 1959 during the peak of the USDA Soil Bank Program.

In North Carolina a survey of 100 program participants showed tax savings of at least 10 percent and the doubling or tripling of income from timber sales as a result of the program. A sawmill program has developed microcomputer software to improve lumber yield and quality. Over 20 sawmills are now using the software; quality/yield improvements of 5 percent are being reported. Another program targeted at limited resource landowners has caused 209 owners to participate in more profitable timber management and improve their forest land through use of soil and water conservation techniques.

Western Range States have held regional rancher workshops on how to use computer programming, riparian area management, and monitoring of grazing systems.

New Mexico, Nebraska, Texas, Oregon, and Wyoming are evaluating and providing information on the impacts of short-duration grazing systems on livestock and range resources.

Estimates of agricultural losses to vertebrate pests in California have been placed at approximately $500 million per year, however, because of wildlife research, educational and technical assistance from various federal, state, and county Extension programs, these losses are reduced to below $100 million.

In Texas, Louisiana, Arkansas, and North Carolina, Extension fish and wildlife educational programs provided management information to landowners and managers that helped them improve their management skills on almost 38.5 million acres. These management practices resulted in increased fish and wildlife productivity and increased profitability by well over $15 million from the returns of fish and wildlife income-producing enterprises. A 19-county pilot project in Texas to improve wildlife management and marketing of access opportunities for fishing and hunting helped ranchers improve their income by a total of over $7 million.

New York has identified the destructive influence that timber harvesting has on the forest, and has designed educational programs designed to help loggers adopt better business practices and less destructive logging methods. The result has been an improved safety record, increased productivity, and less resistance to harvesting on the part of landowners. Loggers formed an association to certify those loggers who would agree to practice "clean" logging practices that protect the interests of those landowners who will not permit harvesting until such assurance is available.

Vermont forest products businesses increased their capital investment by $300,000 and value-added by $1 million as a result of educational programs that emphasized business management and new technology.

Several states provided information to producers on the value of range improvement practices. Colorado, Nevada, South Dakota, and Wyoming jointly developed and sponsored a biennial 3-day Range Beef Cow Symposium. Texas has an extensive education program on brush management techniques which uses field demonstrations, publications, and workshops. Kansas has developed a number of publications relating to the use of fire in range management. Colorado established five demonstration range seedings in 1984 to inform producers about plant materials adapted to different parts of the state. In addition, Colorado trained Extension agents, producers, and agency technicians on the use of fire in brush management. As a result, 2,480 acres of range seedlings and 2,700 acres of fall burns were completed in 1984 that produced between 9,500 and 9,900 animal unit months of new forage and will result in an additional $100,000 of livestock income each year.

Cooperative Extension in Utah and Louisiana provided training and assistance to locally elected officials and community leaders in site design for city and county parks and county fairgrounds, as well as other landscape and site improvement projects.

New York, Maryland, Vermont, Texas, Michigan, Missouri, Minnesota, Arkansas, Alabama, and Kentucky delivered programs to the owners and managers of recreational enterprises to improve their business skills, increase the profitability of their enterprises, and improve their recreation facilities and services. Programs are also conducted for park and recreation professionals in response to the specific needs of these decisionmakers.

Kansas conducted an Urban and Community Forest Program that involved 150,000 acres of trees with an estimated value of $963 million. These forests provided protection from solar radiation, wind, noise, air pollution, and soil erosion. They also provide privacy, esthetics, and wildlife habitat. In 1984, this program involved 75 communities. The participants indicated at the completion of the program that they would be able to double the dollar value of their forests through better management over the next 20 years.

Mississippi conducted a statewide public policy program that included 20 workshops and the distribution of over 75,000 publications related to environmental management of natural resources. The result was wider public participation in public policy decisionmaking. California, Colorado, Hawaii, Michigan, North Carolina, Virginia, Connecticut, West Virginia, Wisconsin, Tennessee, Louisiana, Oregon, Nebraska, and Wyoming also conducted public policy workshops.

WEDNESDAY, MARCH 19, 1986.

NATIONAL AGRICULTURAL LIBRARY

WITNESSES

ORVILLE G. BENTLEY, ASSISTANT SECRETARY, SCIENCE AND EDUCATION
JOSEPH H. HOWARD, DIRECTOR, NATIONAL AGRICULTURAL LIBRARY
SAMUEL T. WATERS, ASSOCIATE DIRECTOR, NATIONAL AGRICULTURAL LIBRARY
STEPHEN B. DEWHURST, BUDGET OFFICER, DEPARTMENT OF AGRICULTURE

Mr. WATKINS. We now have National Agricultural Library.

Dr. BENTLEY. I would like to ask Mr. Howard to come forward.

Mr. WATKINS. OK.

Mr. WATKINS. Dr. Bentley and Mr. Howard, welcome.

Before you deliver your statements, I would like to ask if they are closing you down at 5:30 or earlier every day?

Mr. HOWARD. No, because we have already been closing at 5:30.

Mr. WATKINS. All right.

Mr. HOWARD. And weekends. So we have not had that joy of opening.

Mr. WATKINS. Do you open up at the same time as Mr. Myers, Mrs. Smith and my farmers, about 4:30 every morning?

Mr. HOWARD. No. We start our farm a little later. We are open from eight to five.

Mr. WATKINS. You may proceed.

Dr. BENTLEY. Thank you, Mr. Chairman.

I have made a brief reference in my opening statement to the National Agricultural Library. At this point, I would not add anything more than to emphasize the point I made was that we see the National Agricultural Library as part of the national structure as far as information dissemination focus on high priority, our new areas and higher priority areas that are perhaps somewhat newer. And the Library provides an important function, a key function in bringing information together.

Also they are looking at new technology in terms of information dissemination or in storage, but particularly in storage and dissemination.

And so I am pleased to call on Mr. Howard who will give a presentation on the Library.

Mr. WATKINS. Okay.

Mr. HOWARD. Mr. Chairman and members of the Subcommittee, I welcome this opportunity to appear before you to discuss the proposed FY 1987 budget for the National Agricultural Library. And with your permission, I will summarize my statement and submit it for the record.

NAL has traditionally provided information on all agricultural subjects. We foresaw an opportunity to expand the quality and quantity of services on an incremental basis. And to help encourage it, to help accomplish this, NAL is establishing information centers on various subjects.

The Food and Nutrition Information Center is a well established center. Other centers have recently been created focusing on major

agricultural topics—aquaculture, biotechnology, critical agricultural materials, and food irradiation.

Additional centers on alternative farming systems, fibers, horticulture, animal welfare, rural information, and the family are being planned.

The centers serve as the national focus for information dissemination activities. Designation of a topic for an information center means that NAL will appoint staff persons who will take partial responsibility for that—will take responsibility on a part-time basis for that topic.

We also worry about related collection development activities. We have been making contacts with topical subject experts. We try to cover the indexing of the materials more thoroughly, and we try to provide some bibliographic products. And so we are pleased with these. And with a minimum amount of additional investment, we have been able to make some headway on some of these topics.

As to new technologies, the high priority given to the actual or potential uses of new technologies in library services and operations was evident in our work on several automation projects.

One is that we have developed a laser disc technology, and that disc contains 95 chapters of the Pork Industry Handbook and 200,000 bibliographic records, and the disc, a 12-inch disc is three-quarters empty. But you can search this disc by any word in the text. So it is a new technology that we are experimenting with.

And we have another project underway doing more research on that.

We have also been working with the private sector on developing the utilization of the CD-ROM discs, which are five-inch laser discs, and we hopefully will soon have five discs for use throughout the Nation that will contain two million records.

We have set up recently a national demonstration center for computer software, microcomputer software. And while we do not have more funds to purchase this material, we are seeking it through gifts, and it has been a very rewarding kind of thing. The users are responding, and we promise that we will catalogue it and put it into a video record and make it available to the Nation. And you might notice that it is available, available to the Nation. We hope to be able to continue that and expand it in the future.

Another technology that we are very interested in concerns a collection of more than 500,000 photographs that we have received from the Forest Service. And we have a pilot project working with that on putting that onto a laser disc technology which will hold 108,000 and up items on the disc. We are making progress on that and we hope by fall we will have a disc to show you.

We are also using an electronic instructional package and that is being done in cooperation with the University of Maryland.

These are only a few of the items that we have been working on this year, that we are pleased with, and we think we have made a lot of headway. But we hope to continue this work as well as the traditional library services that we have been providing all along.

For 1987 we have been proposing a budget of $11,421,000. Included are thrusts for developing information centers and making use of advanced technology, and that totals $97,000. And we are also

asking for an increase of $61,000 to partially fund a feed composition data bank that we have there at the Library.

If you have questions, I will be glad to try to answer them for you.

Thank you.

[CLERK'S NOTE. The full text of Mr. Howard's prepared statement appears on pages 947 through 951. The explanatory notes appear on pages 952 through 965.]

Mr. WATKINS. Thank you, Mr. Howard.

I said something about Gramm-Rudman awhile ago, but how did you absorb that $485,000, and what was cut? We have all shared with tears the cuts that have been made.

Mr. HOWARD. Yes, we share that with lots of people.

And it is a wonderful difficult challenge to try to cut 4.3 percent. We have cut the book budget by about 23 percent on that. We have cut about nine positions out of our 190. We have cut back on custodial services. Well, many things will be affected.

Again it hurts, but we are still in operation. And we are still trying to do a good job.

Mr. WATKINS. Are you maintaining everything A-okay?

Mr. HOWARD A-okay considering.

Mr. WATKINS. Mrs. Smith?

Mrs. SMITH. I am just tremendously impressed by all of these advances and all of these changes. Your report was extremely interesting.

LAND GRANT LIBRARIES

Mrs. SMITH. How extensively do our land grant libraries use the information you provide?

Mr. HOWARD. Land grant libraries made very heavy use of various NAL information. AGRICOLA, the bibliographic database created and maintained at NAL, is avaiable online from a number of online service vendors. Although we cannot get usage statistics from these vendors because it is considered proprietary, we do know that AGRICOLA is one of the most highly used databases on the DIALOG system.

In addition to bibliographic information, NAL also provides a document delivery service to USDA employees in the field, utilizing the services of the land grant libraries. These institutions make heavy use of NAL-provided data in carrying out this nationwide regional document delivery system.

Mrs. SMITH. Have they been receptive to your new developments of the videodiscs?

Mr. HOWARD. The land grant libraries have been very receptive to our laser videodisc project. At this time, we have received responses from 15 institutions which will participate in the project. An equal number have expressed interest but have been unable to obtain funding to pay for necessary hardware and software.

Mrs. SMITH. Will they have any difficulty in obtaining the necessary hardware and software to utilize this new storage medium?

Mr. HOWARD. Technically, there is no difficulty in obtaining the appropriate hardware and software. Various vendors have the equipment for sale. The greater difficulty is in getting funding for

the purchase of the equipment. Most libraries who will participate have the money available as part of their regular budgets. Other libraries are working jointly with other state agencies to come up with the necessary funds.

Mrs. SMITH. Thank you, Mr. Chairman.

Mr. WATKINS. Thank you. Mr. Myers?

Mr. MYERS. Did you get your roof fixed?

Mr. HOWARD. Yes.

Mr. MYERS. The roof has come out. We can keep the water off the ceilings.

Mr. HOWARD. Yes, that is right. Thank you for your help in getting the roof on.

Mr. MYERS. Well, that is pretty important. You know, you can do without—sleep on the floors, a few things like that, but you cannot do without a roof very long.

Mr. HOWARD. If you ruin your books, you are in trouble.

Mr. MYERS. That is right.

Thank you.

Mr. WATKINS. Mr. Howard, I have to confess to you, I have not been out to visit.

Where is the Library located?

Mr. HOWARD. Across the street from ARS Headquarters in Beltsville. If you drive around the Beltway, we are the tall building standing out there that people sometimes refer to as the grain elevator.

Mr. WATKINS. The grain elevator?

Mr. HOWARD. If you see that, stop by and we will welcome you.

Mr. WATKINS. Let me ask some other questions here. But I do want to be polite to my two colleagues who are always waiting. I know Myers is usually waiting, and I want to let him have a few questions early this time.

Did you notice that?

Mr. MYERS. I appreciate it. You see, we serve on another—all three of us serve together in the morning, and he uses all that time. I often complain on that committee I have no parochial or provincial interests in that committee as far as personally. And they all do have. And I sit there with envy as they say can we get just a little bit more.

But here I want to be up in front of the trough when it comes to me.

Mr. WATKINS. As Acting Chairman, he took more than his time. I just want you to understand the new procedure.

Mr. MYERS. Yes, I appreciate that. We appreciate that. Thank you.

Mr. WATKINS. Let me ask a couple of other questions.

I am interested in your centers. You have got some new ones going and the Food and Nutrition Service was one of those I believe.

Mr. HOWARD. There is a center in the Library that works with that.

Mr. WATKINS. Okay.

Earlier today I asked them about food irradiation. I see you have got it listed as one of the things that you have quite a bit of information on in the Library.

Mr. HOWARD. We have announced that about six months ago the setting up of the Food Irradiation Information Center. And it has been very rewarding because we have talked to many consumer groups and many of the private sector, as well as USDA and other agencies, and within, I would say, the six months that we have been in operation, we have received a very large collection as a gift from the ARS Center in Pennsylvania. We got that fantastic collection of libraries. Unfortunately, we have not catalogued it yet. We do not have the money to do so. But that is another challenge.

We have three other gifts of very large collections that will be donated to the Library soon. So our next challenge is to be able to know what we have got.

We are already, though, helping people with their questions on what is available and what has been published in the way of food irradiation.

Mr. WATKINS. What about aquaculture biotechnology and other materials?

Are all of your centers located at the Beltsville site?

Mr. HOWARD. Yes, sir. All of them are in the Library, and we do not set aside a particular collection. We use the total collection as the center, but we have people who know where all the material is. So it is all in the Library there.

As one of our opportunities though is contact with other collections throughout the Nation so that we work with them and share some of the collection development possibilities, and we work together. So we try to know where other centers are rather than duplicate.

Mr. WATKINS. Do you interact with land grant universities?

Mr. HOWARD. Most of our interaction outside USDA is with the land grant university libraries. And, for instance, we worked very closely with Purdue on the Pork Industry Handbook.

So we do not have centers there, but we have a working relationship with all the land grant libraries. We meet with those librarians twice a year and discuss various things and various topics and try to work out cooperative arrangements so that we can share the joy instead of having everyone do it twice.

Mr. WATKINS. That is what I was wondering about. Some of them have done some outstanding work.

I am familiar, of course, with Oklahoma State University since I majored in agriculture there and I have spent some time in their Library. John would not believe it.

Mr. HOWARD. At Oklahoma State, Dr. Roscoe Rouse is a friend of ours. He is the librarian there and is a friend of ours. And we work very carefully with him, very closely.

Mr. WATKINS. I am interested in these centers and how they work with the universities and how we might involve them further so there is not a duplication of effects.

Mr. HOWARD. That is right. We do not. We try to make sure that we know—as a National Library, we try to make sure we know where things are if we do not have them.

Mr. WATKINS. Do you participate within the universities by providing grants?

Mr. HOWARD. We have no grant funds like the National Library of Medicine for that. But we do participate in paying half the

microfilming costs for State publications, with the Agricultural Experiment Station and Extension publications in each State. We pay half the microfilming costs. I think that is about the only way we give direct grants to the libraries.

Mr. MYERS. You do have a hookup, do you not, with the computers if some university has material that you need or you have something they need that they can obtain it through the computer?

Mr. HOWARD. That is right. We have a way to request electronically materials through the library system, from us to them and from them to us.

Mr. MYERS. Do you know if they have it?

Is it inventoried in their computers?

Mr. HOWARD. That is right. We work with the Library of Congress as well as these land grants to try to do a national union catalogue so we know where things are. And that is in machine readable form.

Mr. MYERS. Yes. Thank you.

Mr. WATKINS. I just think that designated points of authority on subjects such as an Indiana pork center could be made. I think this adds even more credibility.

Mr. HOWARD. I might add on the pork industry handbook, not only did we work closely with Purdue, but we worked with pork producers elsewhere.

Mr. WATKINS. Yes.

I was thinking of all these computers. I do not know if you have seen the T-shirts that say "Humans Make Errors, Computers Make A Mess," but I am beginning to believe this in trying to keep up with everything that is happening, Mr. Whitten.

RECOMMENDATIONS OF THE BLUE RIBBON PANEL

Mr. WHITTEN. In last year's hearing record on page 600 you identified recommendations made by the Blue Ribbon Panel which had not yet been accomplished due to resource constraints. Are those items listed last year included in your fiscal year 1987 budget request? If not, please identify those items yet to be funded and provide an estimate of the cost of each.

Mr. HOWARD. Last year we mentioned that the Blue Ribbon Panel recommended NAL's resources be increased by $3 million and 50 staff positions. Current budget constraints have limited our implementation of the program. However, we have started development of an integrated library system to fully automate most library functions. Two hundred forty thousand dollars have been earmarked for this in fiscal year 1986. We estimate $300,000 more will be needed to complete the project, but this amount has not been requested in the FY 1987 budget request. In FY 87 we have asked for small sums to initiate expert systems and to extend laser disk advances. However, these two technological advances will require annual funding of $50,000 a year for each. There are also those projects that need implementation funding, such as developing a local network of microcomputer systems within NAL, $100,000; creating an agricultural information network, $300,000; extending NAL coverage of foreign materials, $325,000; development of regional union lists of agricultural serials and keyword

lists of foreign serials, $140,000; and expansion of AGRICOLA training, $50,000. No funds for any of these programs are included in the FY 86 budget request.

FACILITY NEEDS

Mr. WHITTEN. In last year's record on page 621 you provided information on additional facility needs, by topic and estimated cost, that had not yet been funded. Are any of the items listed last year in the fiscal year 1987 budget request? Are there others yet to be funded? Were any of the facility needs scheduled for fiscal years 1985 or 1986 deferred to future years? If so, please identify them for the record according to their relative priority.

Mr. HOWARD. None of the facility needs listed in last year's record were included in the fiscal year 1987 budget request. There are other facility needs yet to be funded.

[Additional information follows:]

All of the facility needs listed for fiscal year 1985 were accomplished, but all of the fiscal year 1986 needs were deferred to future years. The priorities on deferrals are:

1. Replace chillers (2)	500,000
2. Replace transformers (2)	200,000
3. Install fire detectors and sprinkler system in basement	50,000
4. Point up and repair exterior of building	200,000
5. Major overhaul of mechanical and plumbing	250,000
6. Paint and repair interior of building	20,000
7. Improve short term patron parking area	55,000
8. New roof on tower	50,000
9. Repave parking lots	50,000
10. Convert viewing area of computer room to usable space	100,000

REGIONAL DOCUMENT DELIVERY SYSTEM

Mr. WHITTEN. In the explanatory notes you state that the Regional Document Delivery System is continuing to develop. Please provide a table showing the regions, the participating land-grant university, library systems, and planned additions.

[The information follows:]

Region	RDDS Library	States served
Mid-Continent	Iowa State University Library, Ames, IA 50011	CO, NE, KS, IA, MO.
North Central	University of Minnesota, St. Paul Campus Libraries, St. Paul, MN 55101.	MT, ND, MN, SD, WI.
Northeast	Cornell University, Mann Library, Ithaca, NY 14853	MI, NY, OH, PA.
Northwest/Intermountain	Washington State University, Owen-Sci-Eng Library, Pullman, WA 99164.	WA, OR, ID, UT.
Southern	University of Georgia, Science Library, Athens, GA 30602	TN, NC, SC, GA, AL, MS, FL, PR.
Illinois	University of Illinois, Agricultural Library, Urbana, IL 61801	IL.
Southwestern	Texas A&M University, Evans Library, College Station, TX 77843	NM, TX, OK, AR, LA.
Western	University of California, University Library, Davis, CA 95616	CA, NV, AZ, HI.

The phrase "continuing to develop" referred primarily to streamlining or otherwise improving the Regional Document Delivery System policies and procedures to more effectively and efficiently meet the needs of USDA patrons throughout the country.

COLLECTION PRESERVATION

Mr. WHITTEN. How much of the National Agricultural Library budget is used for the preservation of documents? Do the participating land-grant university libraries share the cost of preservation of these documents?

Mr. HOWARD. Half of 1%—$52,900—of the total FY '86 NAL budget of $10,787,000 is allocated for preservation. NAL is working with the land-grant university libraries on a co-operative endeavor to microfilm their State land-grant agricultural publications. These publications consist primarily of publications of the State agricultural experiment stations and State agricultural extension services plus occasionally publications of the departments or colleges of agriculture of the State land-grant university. Forty-two states have participated in the regional arrangements at various times, with NAL contributing half the cost of filming. $9,400 of the NAL total for preservation has been allocated to five land-grant universities for microfilming during FY '86.

INFORMATION CENTERS

Mr. WHITTEN. The fiscal year 1987 budget request includes a net increase of $97,000 to continue the development of Information Centers. Please explain the concept of Information Centers for the record. Also, please identify the Information Centers developed to date, those scheduled for development in fiscal year 1986, and those planned for fiscal year 1987.

Mr. HOWARD. The impetus behind the creation of information centers at NAL was the recommendation in 1982 by the Interagency Panel for the Assessment of the National Agricultural Library, known as the Blue Ribbon Panel, to the Secretary of Agriculture, that NAL enhance its responsiveness to its current clientele and in the process reach new user groups. On the basis of the recommendations in the Blue Ribbon Panel Report, Congress provided NAL with additional positions with the goal being to increase the quantity and quality of its information services.

To help accomplish this goal, NAL decided to create information centers on various subjects and in doing so work with support groups in industry, Federal and State agencies, and the scientific community to establish these Centers as national focal points for information dissemination activities.

Several factors have determined what subject areas within the broad-based discipline of agriculture would be initially covered. These include: Congressional mandate, Priorities within the U.S. Department of Agriculture, Availability of subject expertise on NAL's staff, and Financial support and interest by agricultural trade and professional organizations.

Information centers are not physically isolated units. Materials are housed at NAL within the regular collection, and NAL's extensive holdings provide the bibliographic foundation from which the Centers can grow. Assignment of personnel is based on specialized knowledge of the subject area. The designation of a topic as an information center will result in increased activity on several fronts all targeted to specific user groups within industry, Federal and State agencies, and the scientific community. Such activities in-

clude collection development, information products, outreach, and public services.

Since the introduction of the information centers concept the following centers have been established and are operational, Alternative Farming Systems, Aquaculture, Biotechnology, Critical Agricultural Materials, Family, Fiber, Food and Nutrition, Food Irradiation, and Grain Dust.

Those Centers scheduled for development in the remainder of fiscal year 1986 are Horticulture and Animal Welfare.

Among other topics being considered for future information centers, pending the availability of staff and funds, are Forestry, Poultry and Rural Information.

INFORMATION CENTERS

Mr. WHITTEN. Have the Information Centers increased the productivity of the National Agricultural Library? Please explain for the record.

[The information follows:]

Over the past year and a half the number of information centers at NAL has increased from 1 to 11. Although the older more mature Centers have more tangible results to show, all of the Centers are currently increasing quantity and quality of information services to current clientele, while expanding responsiveness to new user groups.

Information Center accomplishments which have resulted in increased efficiency and productivity at NAL are the following:

Regularly scheduled outreach activities such as presentations to selected audiences, attendance at professional meetings and trade shows, traveling exhibits, demonstrations of new technology and software, and specialized brochures and pamphlets all serve to increase public awareness of NAL products and services. Audiences not previously reached are now using our services.

Intensive collection development activities by information center subject specialists in the identification and acquisition of new books, journals, audiovisual material and computer software, as well as historical collections, have served to enrich the research collection and reinforce NAL's stature as a national library. Organizations and interest groups targeted by information centers have donated materials and historical collections to NAL as well as funds, in some instances, to process these collections. As a result, NAL has been able to conserve funds and staff time that would otherwise have been used to acquire and organize these publications for use.

Development of customized information products or finding aids such as directories of experts, institutions, associations and current research as well as bibliographies and guides to the literature, has served to provide a link between specific user groups, NAL's vast collection, and primary resources located outside of NAL. Improved reference productivity here and elsewhere allows NAL to do more in less time.

The development of information center response networks has resulted in expanded information services for answering consumer and scientific inquiries. Inquiries are channeled to the appropriate subject specialist which results in in-depth, timely service. The Centers also serve as an information clearing house referring users, where appropriate, to other key information resources within the Department.

FEED COMPOSITION DATA BANK

Mr. WHITTEN. Are you proposing to physically relocate the data base to NAL, or are you proposing to provide funding to continue the operations at Utah State University,

Mr. HOWARD. As per agreement with all parties involved, the Feed Composition Data Bank will be physically transferred to NAL effective October 1, 1986.

Mr. WHITTEN. Please identify for the record, the major users of the data base.

Mr. HOWARD. The major users are the American Feed Industry Association—AFIA—the Association of American Feed Control Officials—AAFCO, the Committee on Animal Nutrition of the National Research Council, and research scientists at state agricultural experiment stations involved in animal nutrition research and plant production research, agricultural scientists at state universities and in the private sector engaged in animal nutrition studies, and extension personnel. In addition, the Feed Composition Data Bank serves as the international resource on feed information and identification to Agriculture Canada; the Australian Feeds Information Centre CSIRO, Australia; the International Network of Feed Information Centers; Ministry of Agriculture, Fisheries and Food, United Kingdom; and Dokumentationsstelle der Universitat Hohenheim, Federal Republic of Germany.

Mr. WHITTEN. Is this a system that could be operated with funds generated by user fees,

Mr. HOWARD. When this database is fully developed, user fees could partially offset the cost of operation.

Mr. WHITTEN. In general terms, please explain the funding problems that caused Utah State University to stop maintaining the system.

Mr. HOWARD. I understand that apparently Utah State University reached the decision that it was not appropriate for it to use state and university funds to maintain a database that had become national and international in scope. When the database was initially developed, it was in support of Utah State Experiment Stations only but quickly was recognized as a national and international authority on feed and feedstuffs information. Utah State University officials agreed that the data bank was within the scope of USDA's mission and should have its support.

CONTRACTUAL SERVICE

Mr. WHITTEN. Please explain for the record the estimated cost and savings of $29,000 you propose to achieve by contracting for document retrieval, photocopying and reshelving documents. Will not NAL staff still be involved in handling requests from users? How is it possible to save money when two staffs are involved in the same operation as opposed to only utilizing the NAL staff?

Mr. HOWARD. The two staffs will be performing two separate functions. NAL staff will accept the requests from users, search them for ownership and then turn them over to the contractor for processing. The contractor's staff will perform the low level, labor intensive, highly manual tasks of retrieving the material from the shelves, photocopying, mailing and reshelving the material. A contractor can provide the staff to perform these duties at a lower cost than can the Government. If the material is not available or is not owned, NAL staff perform the tasks of identifying locations and borrowing the material from other libraries.

ASSISTANCE TO THE FOOD AND AGRICULTURE ORGANIZATION

Mr. WHITTEN. In the explanatory notes on page 9g–2 reference is made to assistance provided to the Food and Agricultural Organiza-

U.S.D.A. Regional Document Delivery System

O Regional Coordinating Libraries

October 1984-
September 1985

tion in placing its AGRIS data base on-line in the United States. Was this done on a reimbursable basis?

Mr. HOWARD. In 1985 NAL negotiated an interagency agreement with National Technical Information Service (NTIS) which provides for distribution in the United States of the machine-readable AGRIS bibliographic records. Commercial systems that subscribe to these records provide on-line access to the data base, much as they currently do with AGRICOLA.

This was done, not on a reimbursable basis, but rather to increase the accessibility of world wide agricultural literatue in the United States. NAL does, however, receive a portion of the data base royalties which accrue through the use of AGRIS by users of the commercial systems.

The royalty is based on usage and includes both on-line access charges and a sliding scale for off-line processing. The royalty accrues at the rate of 80% to NAL and 20% to NTIS. NAL's portion of the royalty is to be utilized in enhancing the contents of or increasing the use of the AGRIS data base. We do not yet know what NAL's share of the royalties will be.

Mr. WATKINS. I want to thank you. I know that you moved up your schedule a day to testify, and I think I can speak in behalf of the Chairman and entire Committee in thanking you for working with us. I know it took some rescheduling. But we are all under a time schedule that is difficult.

Thank you. I appreciate the opportunity to get more information on this. I have a couple of suggestions later on that maybe we might work on for the further development of the Library.

Thank you.

NATIONAL AGRICULTURAL LIBRARY

Statement of Mr. Joseph H. Howard, Director, National Agricultural Library, before the House Committee on Agriculture, Rural Development, and Related Agencies.

Mr. Chairman and members of the Subcommittee, I welcome this opportunity to appear before you to discuss the proposed fiscal year 1987 budget for the National Agricultural Library (NAL).

NAL has traditionally provided information on all agricultural subjects. With the provision of some extra positions, NAL foresaw an opportunity to expand the quantity and quality of services on an incremental basis. To help accomplish this, NAL is establishing information centers on various subjects.

The Food and Nutrition Information Center (FNIC) is a well established center. Other centers have recently been created focusing on major agricultural topics--aquaculture, biotechnology, critical agricultural materials, and food irradiation.

Additional centers on alternative farming systems, fibers, horticulture, animal welfare, rural information, and the family are being planned.

Based primarily on the Library's 1.8 million volume collection, the centers serve as national focal points for information dissemination activities. They are designed to provide selective, in-depth subject coverage for researchers, educators, and communicators as well as reaching out to potential new user groups.

The centers are not physically isolated units; materials are housed at NAL within the regular collection. But designation of a topic as an information center means that (1) NAL will appoint one or more staff members to devote special attention to that topic, (2) related collection development will be strengthened and special collections on the topic may be sought, (3) contacts will be made with topical subject experts and related organizations, (4) indexing of materials on that topic will be improved (if appropriate), (5) special bibliographic and other information products on the topic may be prepared, and (6) the fact that pertinent materials are available at NAL will be promoted.

The high priority given the actual or potential uses of new technologies in library services and operations was evident in a number of automation projects.

Leading the list, the MITRE Corporation completed a detailed requirements document to be used as the basis for the competitive procurement of a projected integrated library system in 1986. The MITRE staff with knowledge of and experience with library operations worked with NAL staff to complete the documentation which describes in detail the implementation plan for the integrated library system procurement. This plan includes a personnel recruitment and training plan and a plan to procure, install and test the new hardware and software (acceptance test).

As another thrust, NAL has conducted an evaluation study using laser video disc for the storage and retrieval of full-text agricultural information. The study consisted of creating a 12-inch laser disc containing the Pork Industry Handbook and 200,000 records from the NAL bibliographic database, AGRICOLA. This has been done with the cooperation of Extension, Purdue University, and the Pork Producers Council.

Based on the initial success of that study, the NAL is proceeding with a project to produce a second videodisc. This disc is to contain the full text, plus associated graphics, for 13 other agricultural publications. The disc will be offered to land grant libraries who have, or are willing to procure, the necessary hardware and software to utilize this new storage medium.

The creation of specialized local databases was another area of automation activity. A joint project was launched by NAL, Cuadra Associates, and the USDA-Plant Variety Protection Office, to create a local file of catalog records for the NAL Seed Trade Catalog Collection. Cuadra has developed a program to download and convert Online Computer Library Center, Inc., (OCLC) catalog records to local systems which utilize the Alpha Micro computer and the STAR software system. The local files can then be enhanced to meet local needs. Approximately 1,800 records have been cataloged and downloaded. Online access is provided to various user sites at NAL.

The NAL also began working with DISCLOSURE, Inc. in a marketing survey on the utilization of CD-ROM discs for the distribution of bibliographic information. By agreement, and working with NAL and Cornell University, DISCLOSURE will utilize the AGRICOLA database to master CD-ROM discs which will then be made available to selected test sites. Another private firm, Oryx Press, has also announced their intention to produce the AGRICOLA database on CD-ROM discs.

A national demonstration center for food and nutrition microcomputer soft ware was established at the Library with an initial collection of over 70 food and nutrition programs. Persons from all over the nation visited the center for demonstrations and hands-on experience with the various programs. Software producers donated demonstration disks or copies of their programs with full documentation for inclusion into the AGRICOLA database as well a for the use of patrons of the NAL Food and Nutrition Information Center. NAL is expanding this service as well.

A collection containing more than 500,000 photos and several thousand slides was acquired by the NAL from the Forest Service, USDA. The Forest Service permanent image data base--an online index to these images--will also be administered by the NAL. Negatives of the collection materials are housed at the National Archives and prints can be ordered from that institution. As part of the transfer agreement, the Library will do a pilot study on the use of laser technology for storage of and access to a portion of the collection.

In addition to forestry, the collection also includes pictorial documentation of the nation's movement in its later agricultural stages as well as the opening and early development of public lands. NAL is working with Forest Service, the National Archives, and the University of Maryland on this project.

An electronic instructional package utilizing laser disks coupled with personal computers is being developed to further encourage and improve the online use of AGRICOLA, the Library's master bibliographic data base. The courseware for the new program--being designed under a cooperative agreement with the University of Maryland--is intended for instruction at the introductory, intermediate, and expert levels using a one-on-one approach or to assist an instructor in a workshop context.

These are only a few of NAL programs that have been singled out for highlighting in that they represent new thrusts and new potential in our effort to provide agricultural information to the nation.

We propose a fiscal year 1987 budget of $11,421,000. Included are thrusts for developing information centers and making use of advanced technology, $97,000. An increase of $61,000 is also requested to partially fund a feed composition database.

Mr. Chairman, I have with me today the Associate Director, Mr. Sam Waters. He and I will be happy to answer any questions that you might have.

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9-1

NATIONAL AGRICULTURAL LIBRARY

Purpose Statement

The National Agricultural Library (NAL) had its mission outlined by the Organic Act of 1862, establishing the Department of Agriculture. The act sets forth a mission, "to acquire and to diffuse among the people of the United States useful information on subjects connected with agriculture in the most comprehensive and general sense of the word," and placed upon the Secretary the responsibility to "procure and preserve all information concerning agriculture which he can obtain by means of books..."

The NAL has as its ultimate purpose the dissemination of useful information about agricultural and other related sciences to scientists and researchers, administrators and managers, farmers, and to the general public. In addition to providing traditional library services such as bibliographies, reference services and document delivery to agricultural scientists and researchers, NAL is expanding its role and serving a wider audience by using modern information dissemination technology to its fullest. Traditionally, the library has concentrated its thrust towards the agricultural scientist and researchers. The wider audience includes Federal, State and local administrators, as well as the farmer, the small businessman, public groups at all levels, and the general public.

With approximately 1.8 million volumes of printed material on agriculture and supporting scientific disciplines, NAL has one of the largest collections of its kind in the world. Both current and historical information is collected and organized for effective utilization by a wide range of users. The NAL also provides input of U.S. publications to AGRIS (Agricultural Information System), the International Information System for the Agricultural Sciences and Technology.

National Agricultural Library operations are carried out at the NAL Building at Beltsville, Maryland. Specialized services are provided from a reference center in Washington, D.C. Service is provided from these locations as well as 18 officially designated field libraries in the States and 38 "information" centers containing a total of approximately a quarter of a million volumes.

As of September 30, 1985, the NAL employment was 157 full time and 22 other, all located in Beltsville and Washington.

9-2

NATIONAL AGRICULTURAL LIBRARY

Available Funds and Staff-Years

1985 Actual and Estimated, 1986 and 1987

Item	1985 Actual		1986 Estimated		1987 Estimated	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
National Agricultural Library	$11,455,000	173	$11,263,000	186	$11,421,000	186
Obligations under other USDA appropriations:						
Agricultural Research Service: Library space	199,418	---	177,477	---	177,477	---
Agricultural Marketing Service: Library space	15,049	---	16,740	---	16,740	---
Cooperative State Research Service: Library Space	19,407	---	19,838	---	19,838	---
Agricultural Research Service: Animal Parasitology Transfer	36,500	---	---	---	---	---
Animal & Plant Health Inspection Service: Current Awareness Literature Service	12,000	---	20,608	---	20,608	---
Forest Service: Current Awareness Literature Service	10,000	---	32,973	---	32,973	---
Extension Service: Current Awareness Literature Service	6,000	---	15,800	---	15,800	---
Human Nutrition Information Service: Current Awareness Literature Service	---	---	6,184	---	6,184	---
Economic Research Service: Current Awareness Literature Service	---	---	8,243	---	8,243	---
Food Safety Inspection Service: Current Awareness Literature Service	5,000	---				
Forest Service: Provide Translations Service	4,000	---	956	---	956	---
Agricultural Research Service: Provide Translations Service	13,400	---	11,572	---	11,572	---
Soil Conservation Service: Provide Translationn Service	900	---	302	---	302	---
Economic Research Service: Provide Translations Service	200	---	---	---	---	---
Animal & Plant Health Inspection Service: Provide Translations Service	22,600	1	33,710	1	33,710	1
Cooperative State Research Service: Provide Translations Service	900	---	2,516	---	2,516	---
Agricultural Research Service: Feed Composition Data Base	100,000	3	150,000	3	---	---
Agricultural Research Service: Current Awareness Literature Service	652,537	---	655,954	---	655,954	3

9-3

NATIONAL AGRICULTURAL LIBRARY

Available Funds and Staff-Years

1985 Actual and Estimated, 1986 and 1987

Item	1985 Actual		1986 Estimated		1987 Estimated	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Food and Nutrition Information Service:						
Service to Schools	$ 90,000	---	$ 90,000	---	$ 90,000	---
Forest Service:						
Laser Disk Technology	30,000	---	---	---	---	---
Total Other USDA Appropriations	1,217,911	4	1,242,873	4	1,092,873	4
Total Agricultural Appropriations	12,672,911	177	12,505,873	190	12,513,873	190
Non-Federal Funds						
Sale of Photocopies	59,483	2	60,000	2	60,000	2
Total National Agricultural Library	12,732,394	179	12,565,873	192	12,573,873	192

Full-Time Equivalent Staff-Year:	1985 Actual	1986 Estimated	1987 Estimated
Ceiling	157	180	180
Non-Ceiling	22	12	12
Total	179	192	192

9-5

NATIONAL AGRICULTURAL LIBRARY

CLASSIFICATION BY OBJECTS

1985 and Estimated 1986 and 1987

	1985	1986	1987
Personnel Compensation:			
Headquarters.....	$4,632,031	$4,700,000	$4,800,000
11 Total Personnel Compensation.....	4,632,031	4,700,000	4,800,000
12 Personnel Benefits	496,018	550,000	550,000
Total Pers. Comp. & Benefits.....	5,128,049	5,250,000	5,350,000
Other Objects:			
21 Travel.....	64,352	80,000	80,000
22 Transporation of things.....	20,830	30,000	30,000
23 Communications, utilities and other rent.....	766,603	830,000	900,000
24 Printing and reproduction.....	433,129	300,000	300,000
25 Other services.....	2,891,076	2,741,000	2,690,000
26 Supplies and materials.....	1,469,222	1,432,000	1,471,000
31 Equipment.....	681,735	600,000	600,000
Total Other Objects	6,326,951	6,013,000	6,071,000
Total Direct Obligations	11,455,000	11,263,000	11,421,000
Position Data:			
Average Salary, ES positions	$70,263	$70,263	$70,263
Average Salary, GS positions	$21,580	$21,580	$21,650
Average Grade GS positions	7.65	7.65	7.66

9-6

NATIONAL AGRICULTURAL LIBRARY

The estimates include appropriation language for this item as follows (new language underscored; deleted matter enclosed in brackets):

National Agricultural Library

For necessary expenses of the National Agricultural Library, [$11,272,000] $11,421,000: Provided, That this appropriation shall be available for employment pursuant to the second sentence of section 706(a) of the Organic Act of 1944 (7 U.S.C. 2225), and not to exceed $35,000 shall be available for employment under 5 U.S.C. 3109: Provided further, That not to exceed $575,000 shall be available pursuant to 7 U.S.C. 2250 for the alteration and repair of buildings and improvements.

UNITED STATES DEPARTMENT OF AGRICULTURE

NATIONAL AGRICULTURAL LIBRARY

PERMANENT POSITIONS BY GRADE AND STAFF-YEAR SUMMARY

1985 and Estimated 1986 and 1987

GRADE	1985 HEADQUARTERS	1986 HEADQUARTERS	1987 HEADQUARTERS
ES-5	1	1	1
GS/GM-15	2	2	2
GS/GM-14	7	7	7
GS/GM-13	15	15	15
GS-12	10	10	10
GS-11	39	39	39
GS-9	12	12	12
GS-8	3	3	3
GS-7	19	19	19
GS-6	27	27	27
GS-5	28	28	28
GS-4	7	7	7
GS-3	2	2	2
GS-2	3	3	3
Other Graded Positions	19	19	19
Total, Permanent Positions	194	194	194
Staff-Years:			
Ceiling	157	180	180
Non-Ceiling	22	12	12
Total, Staff Years.....	179	192	192

9-7

NATIONAL AGRICULTURAL LIBRARY

Appropriation Act, 1986	$11,340,000
Budget Estimate, 1987	11,421,000
Increase in Appropriation	+81,000

Adjustments in 1986:		
Appropriation Act, 1986	$11,340,000	
Less Pro-Rata Reduction, P.L. 99-190	-68,000	
Net Appropriations	11,272,000	
Transfer to Departmental Administration and Office Of Governmental and Public Affairs for reimburseable activities	-9,000a/	
Adjusted Base for 1986		11,263,000
Budget Estimate, 1987		11,421,000
Increase over adjusted 1986		+ 158,000

a/ A transfer of $6,000 to Departmental Administration and $3,000 to Office of Governmental and Public Affairs is to fund activities previously financed on a reimbursable basis as a direct appropriation in FY 1987.

SUMMARY OF INCREASES
(On basis of adjusted appropriation)

Items of Change	1986 Estimated	Program Changes	1987 Estimated
Feed Composition Database	---	+$61,000	$ 61,000
All Other	11,263,000	97,000a/	11,360,000
Total Available	$11,263,000	$+158,000	11,421,000

a/ $97,000 to be applied to Advanced Technology and Information Centers (Net of A-76 savings of $29,000).

PROJECT STATEMENT
(On basis of adjusted appropriation)

PROJECT	1985 Actual Amount	1985 Actual Staff Years	1986 Estimated Amount	1986 Estimated Staff Years	Increase	1987 Estimated Amount	1987 Estimated Staff Years
1. Agricultural Library Services for Research and Education	$11,155,000	173	$10,963,000	186	$ +158,000	$11,121,000	186
2. Repair and Maintenance of Facilities	300,000	---	300,000	---	---	300,000	---
Total available or estimate	11,455,000	173	11,263,000	186	+158,000	11,421,000	186
Transfer to Departmental Administration and Office of Governmental and Public Affairs	+9,000	---	+9,000				
Total Appropriation	11,464,000	173	11,272,000	186			

EXPLANATION OF PROGRAM

The National Agricultural Library (NAL) with a collection of 1.8 million volumes, is the largest agricultural library in the free world. It is one of three national libraries, along with the Library of Congress and the National Library of Medicine. It is the coordinator and primary resource for a national network of State land-grant and field libraries. It serves as the U.S. center for the international agricultural information system.

The basic function of the Library is to identify, acquire, disseminate, and deliver pertinent food and agriculture information to all scientists, researchers, administrators, and others working in agricultural fields in both the government and private sectors. To meet user needs, the NAL maintains an extensive collection of agricultural publications and provides access to these publications through AGRICOLA, its master data base. The Library also provides current awareness and retrospective searches on worldwide agricultural literature through other computer-based systems of interest to agricultural scientists and educators.

A national education and training program designed to inform actual and potential users about NAL operation, resources, and services offers workshops and demonstrations in cooperation with agricultural institutions across the country. The emphasis in this program is on the use of online bibliographic files and other computer services. Briefings, tours and exhibits are provided for domestic and foreign visitors to the Library.

Acquisitions of agricultural materials from 150 countries and in more than 30 languages continues to be a major acitivity in carrying out the mission of the library components of NAL. Other primary activities for fiscal years 1985, 1986 and 1987 are as follows:

Types of Activities	Estimated Productivity		
	FY 1985 Actual	FY 1986 Estimate	FY 1987 Estimate
Serial Issues Added	195,927 1/	180,000	185,000
Number of Titles Cataloged	19,786	20,000	25,000
Articles Indexed	69,099 2/	80,000	80,000
Volumes Bound	7,081 3/	10,000	10,000
Document Requests Filled	228,257	230,000	235,000
Reference Inquiries Answered	23,661	25,000	30,000
Automated Searches Conducted	7,656	8,000	9,000
Current Awareness (CALS) Searches	216,000	220,000	265,000
Current Awareness (CALS) Profiles by all data bases	3,000	3,200	3,400

1/ Increase over FY 1986 due to the cataloging and input of the Nursery and Seed Trade Catalog that was done on contract.
2/ Reduced production from FY 1986 is the result of the addition and use of a controlled vocabulary.
3/ Reduced figure from FY 1986 due to lower fund availability.

A major function of the bibliographic program is organization of materials for use of researchers and announcement of newly published research to the agricultural community. This includes cataloging books and journals acquired for the collection, and indexing journal articles, conference proceedings, and reports selected for their importance to agricultural research and education. Resources of the collection are made available through direct loan, interlibrary loan of books, and photocopy of journal articles. Requests for documents from USDA field employees are handled locally in 35 States in cooperation with land-grant university libraries whenever possible, with the NAL serving as a backup for document delivery.

The NAL is expanding its collection development and information access through coordination of holdings with and among land-grant universities. It is initiating cooperative indexing and cataloging projects with public and private institutions and strengthening agriculture library and information activities nationally through development and adoption of standardized formats and processing procedures essential for national networking.

The National Agricultural Library has resumed a national role in the processing of current agricultural serials by reactivating its participation in the Conversion of Serials (CONSER) Project. NAL has also been accepted by the Library of Congress as a particpant in the Name Authorities Co-op (NACO) project to build a national name authority file for agricultural serial publications.

The Regional Document Delivery System of the NAL is continuing to develop to meet USDA's needs. Under this system, land-grant university libraries participate with the USDA and the NAL to provide documents and photocopies of articles to USDA personnel and libraries in their States and regional. There are currently 8 regions made up of 35 States and Puerto Rico. The most recent additions are Missouri (in the Mid-Continent Region), the Northeast Region serving Michigan, Ohio, Pennsylvania, and New York (and coordinated by the Mann Library, Cornell University, Ithaca, New York), and the Illinois Region.

In addition, NAL must provide for collection preservation. This includes the microfilming and restoring of important documents, unbound serial issues, newspapers, and historical materials. A nationwide project to film the documents of all land-grant institutions, especially the bulletins, circulars, reports, and other miscellaneous publications of the State agricultural experiment stations and agricultural extension services, is currently underway. Under this program, the NAL works with the land-grant institutions to microfilm for preservation (and for replication) entire runs of these publications, which in may instances go back to the 1890's. The collection is both a valuable research tool for a wide variety of subjects and a practical reference resource for the farmer and the lay public. The documents of 36 States totaling over 2 million pages have been microfilmed since the program began in 1974.

JUSTIFICATION OF INCREASES

(1) A net increase of $158,000 for services consisting of:

(a) A net increase of $97,000 for developing Information Centers, Making use of Advanced Technologies.

Need for Change. Funding is requested to maintain Information Centers and the application of advanced technology. The rapid advances in computer and communication technology have enabled large interactive scientific and technical information retrieval systems to be implemented. Major search services today offer on-line access to millions of bibliographic citations.

In addition, development of knowledge bases is well underway. Knowledge bases contain an analysis and synthesis of published information in a given field and are rough equivalents of text books or state-of-the-art reviews.

As part of this effort, the National Agricultural Library is contributing its resources and staff skills in helping to develop and utilize knowledge data bases and "expert" information systems. An expert system applies inference rules to a knowledge base via computers, in a manner which attempts to mimic the application of human expertise in a particular subject area.

We are in the process of evaluating the effectiveness of laser videodisk technology used in conjunction with the micro-computer technology for the storage, retrieval and dissemination of full text data bases. Laser technology has the potential to change significantly the means by which publications and data bases are stored, distributed and used.

As a dynamic organization, NAL is continually searching for ways to enhance its responsiveness to our current clientele and in the process reach new user groups. To help accomplish this goal, NAL decided to create information centers on various subjects and in doing so, worked with support groups in industry, Federal and State agencies, and the scientific community to establish these centers as national dissemination activities. While information centers are not physically isolated units--materials are housed at NAL within the regular collection--the designation of a topic as an information center will effect increased activity on several fronts including: collection development, information products, outreach and public services.

Nature of Change. Since the introduction of the information centers concept, several centers have been established and are operational. Some of the varied activities of these centers are: food irradiation, aquaculture, biotechnology, critical agricultural materials, and food and nutrition.

The identification of high priority topics for inclusion in the information centers program is an ongoing process. Suggestions and recommendations are considered from all sources. Centers now in the planning stages include alternative farming systems, fibers, horticulture, and the family.

In addition, purchase of technology for digitizing the text of important publications, simultaneously preserving the digitized image and providing such access to all the significant words in the digitized text is being discussed. While providing preservation of text and computer access to it simultaneously, this technology will enable us both to increase productivity and reduce costs of preservation with provision of access to full text of documents.

Other technology to be acquired will enable us to preserve and begin providing access vial laser video disc to huge photograph collection.

(b) An increase of $61,000 to partially fund the Feed Composition Database. (No funds in FY 1986).

Need for Change. The Feed Composition Data Bank (FCDB) is a numeric database containing data on the composition and nutrient content of animal feedstuffs. FCDB was previously maintained by the International Feedstuffs Institute, Utah State University, Logan, Utah, but due to funding problems, this arrangement ended. Transitional funding was supplied by ARS as a reimbursement to NAL. We are now requesting that funds for this special thrust be appropriated to NAL to cover ongoing program costs. NAL should fund the Data Bank to maintain its produced and published wealth of feed composition materials. The wealth of information within the database can determine the most effective formats, medium structure and pricing of these products.

Nature of Change. FCDB consists of two main files, the Name File, a thesaurus-like data file containing the International Feed Number, the official feed name, and feed name synonyms. The second file is the Data File with data on the composition and nutrient values of the feed. Results of feed analysis are picked up through perusal of the literature and unpublished reports. The data bank contains roughly 576,000 data (nutrient) values. At the present time we are reviewing the cost of operating the data base.

As administrators of FCDB, we are uncertain as to the needs of the international community, the research scientists, and the National Research Council's Committees. We hope that a total assessment of the FCDB including product demands, i.e., request for information, tables and publications, by the international community, government agencies, and the feed industry should be completed no later than January 1987. Once that assessment is complete we will have the data we need to provide a revenue plan.

(c) A-76 savings of $29,000 for maintenance and use of the collection.

Need for Change. Supply documents to Library users.

Nature of Change. When requests are received from the users, library staff will continue to determine what service is to be provided and to identify where in the NAL collections the item desired is located. The requests having call numbers for the general collections in the NAL stacks will be turned over to the contractor for retrieval, and once photocopy is done, the contractor will reshelve the publications along with new publications being shelved for the first time, and maintain the shelves in good order.

Provide all services necessary for the sorting, shelving and retrieval of NAL materials.

9g-1

NATIONAL AGRICULTURAL LIBRARY

STATUS OF PROGRAM

The National Agricultural Library (NAL) is strengthening cooperation and contacts with state land-grant institutions and with other USDA agencies. Information centers specializing in specific subject areas are actively being established as NAL seeks to expand the quantity and quality of service. The use of modern communications technology to transmit technical data from the library's large collection to farmers and other agricultural audiences continues to be expanded in conjunction with both public and private groups.

Changes resulting from streamlining the NAL organization have resulted in greater efficiency, speed and effectiveness. Library services were strengthened by organizing the reference function into agricultural subject areas such as economics, marketing, farming and forestry. Also, the Food and Nutrition Information Center was incorporated into a Food, Nutrition and Human Ecology Staff. The information systems operation was expanded to give greater emphasis to computer telecommunications and other new technologies.

Current Activities

Four separate evaluation studies involving electronic storage and dissemination of information were conducted in cooperation with the Department's science and education agencies. Three of these are directly related to storage and retrieval of information from full text data bases, representing a major step forward from the citations contained in the AGRICOLA bibliographic data base currently available online. These pilot projects include full text of publications on laser disks; full text online storage and retrieval; and use of photocomposition tapes for a full text data base. A fourth study is concerned with identifying and utilizing computerized agricultural information sources.

NAL has traditionally provided information on all agricultural subjects. With the provision of some extra positions by Congress, NAL is expanding the quantity and quality of services on an incremental basis. To help accomplish this, NAL is establishing information centers on various subjects. The choice of topics to be covered first depends on several factors such as priorities within USDA, availability of subject expertise on NAL staff, financial support and interest by professional organizations. A few of the centers that are now active are: aquaculture, critical agricultural materials, food irradiation, and horticulture information centers.

The Feed Composition Data Bank of the International Feedstuffs Institute at the Utah State University is being transferred to the National Agricultural Library. The transfer of the data bank is currently in progress. At the same time, all current functions including the maintenance of the International Feed Names File of the International Network of Feed Information Centers (INFIC), and the distribution of publications and Feed Composition Tables will be accomplished by the National Agricultural Library.

Based on recommendations in the USDA Blue Ribbon Panel Report on the National Agricultural Library, work is underway to procure an integrated library system to replace existing batch systems at NAL. The detailed requirements for the system have been completed. They include acquisitions, public access catalog, cataloging, indexing, serials control, and circulation functions.

Arrangements for the exchange of agricultural publications with the Soviet Union and the People's Republic of China (PRC) were significantly improved through the negotiation of new agreements and the expansion of existing ones. In the case of the PRC, the closer ties resulted largely from a dramatic increase in the number of delegations and individuals from that country visiting NAL. Also, China National Publications of Beijing became a subscriber to the AGRICOLA sales tape.

Selected Examples of Recent Progress

Seed Trade Catalog. The Council on Botanical and Horticultural Libraries (CBHL) is working with NAL on a major national project regarding Nursery and Seed Trade Catalogs for the United States and foreign countries. NAL, with advice and guidance from CBHL, will acquire a more comprehensive collection, catalog and preserve the collection, and provide users access to these publications.

National Network of School Food Service Liaison. Each State's School Food Service Association has appointed a liaison to work with the Food, Nutrition and Human Ecology Staff (FNHES). The liaison is responsible for FNHES outreach activities within their State. FNHES has provided suggestions for newsletter articles as well as a table top exhibit and resource displays for State meetings.

Indexing. NAL has assisted the FAO in placing its AGRIS data base online in the U.S. In the past we have been indexing items in many languages from many countries. We firmly believe in cooperation among nations whereby each country indexes its own publications and to this end, NAL will gradually adopt a plan whereby the highest priority will be placed on U.S. publications and will be systematically reducing our coverage of foreign titles already indexed elsewhere, especially in AGRIS.

Cooperative Cataloging. NAL has proposed and is now developing the final details for establishing a network of libraries to participate in a cooperative cataloging project of agriculture monographs using OCLC as the host bibliographic utility. The goal is to catalog cooperatively monographic titles following national standards so that all other institutions can make use of standard records without having to do their own cataloging. This will mean that the AGRICOLA data base will also show, with locations, records of other libraries. It now contains only NAL holdings. We have several institutions who have indicated a willingness to participate. After the details have been worked out we will most likely begin with the U.S. Department of the Interior Library in order to work out the problems before expanding the project to other libraries.

Enhancements to AGRICOLA. NAL is developing resource sharing agreements within the agricultural community to support the growth of the AGRICOLA database as a more complete national agricultural bibliographic resource on a continuing basis.

The AGRICOLA bibliographic database currently represents indexing and cataloging activities at NAL. This is only a subset of agricultural publications brought under bibliographic control in the U.S. Cooperative agreements which will enable other libraries and information centers to input records to AGRICOLA will enhance the usefulness of the database by making more information available to the agricultural community. NAL currently has cooperative indexing agreements with the University of Arizona and the University of Georgia, and is pursuing agreements with a number of other institutions.

Microfilming. The NAL implemented in 1974 a program to film the documents, bulletins, circulars, reports, and other land-grant documents, upon the recommendation of a users and librarians advisory group.

For the most part, NAL has been paying half the cost of the filming, the States the other half. In the past, filming was done on a regional basis, with States joining together to form a region and batching their retrospective filming in periods covering 10 years or more. Two such regions had formed and were aactively working during the 1985 fiscal year; namely the Indiana-Iowa-Missouri region (coordinated by Purdue University, Indiana), and a 12-State southern region coordinated by the University of Georgia. To date, 42 States have participated on this basis.

As work on the above two regions continued, steps were taken to revise the concept of the microfilming project and put it on a more nearly annual basis. Several discussions were held by the Director and communications sent to prospective land-grant libraries to gauge interest in this approach. A majority of the libraries have responded favorably.

Non-bibliographic Agricultural Information. NAL is working to develop and provide access to several computerized non-bibliographic files of agricultural information. NAL already provides information from published data, and provides bibliographic information in computerized form. It is now being asked to participate in developing "knowledge bases" such as the Residue Avoidance Program, and "expert systems" such as the Integrated Reproduction Management Information System.

NAL is currently identifying databases which could be of use, contracting for development, and making them accessible to the agricultural community through commercial vendors of information retrieval services.

Downloading Computerized Information. NAL is working to develop the capability to transfer information from one computer system to another electronically.

NAL is working to acquire and utilize automated information processing and telecommunications technolgies to improve service delivery and program management. USDA scientists and administrators, and NAL staff members make use of many systems, either micro-, mini-, or mainframe computers, in some combinations.

All too often, when information is transferred from one computer to another, it is sent in hard copy form and has to be re-entered at the new computer. This is especially true of people who are building personal bibliographic files with citations from the online databases or from CALS reports. Much of the time-consuming keyboarding could be eliminated if techniques and software could be found to deliver the needed information in electronic form.

WITNESSES

	Page
Army, T.J	323
Bayley, Molly	1
Bentley, Dr. O.G	323, 569, 827, 935
Carlson, W.D	569
Carter, M.E	323
Cherry, Russell	1
Clark, T.J	323
Clegg, Dr. D.O	827
Dewhurst, S.B	189, 323, 569, 827, 935
Greenwood, Dr. M.N	827
Harris, C.I	569
Howard, J.H	935
Jordan, J.P	569
Kinney, T. B., Jr	323
Knipling, E.B	323
Laster, D.B	323
Lee, J.E., Jr	189
Phillips, S.M	1
Rankin, R.R	827
Thompson, R.L	189
Victor, J.R	323
Waters, S.T	935

INDEX

Agricultural Research Service

	Page
A-76 Review	397
ARS Liaison with FDA	421
Acarine Mite	377
Acid Rain	366
Aircraft	399
Animal Health	423
Aquaculture:	
Comprehensive Feeds Production Program	429
Regional Centers For	423
Arboretum, National	400
BARD Agreement	359
Bean and Sugarbeet Research	348
Bee Research, Africanized	376
Beltsville Research Center	346, 431
Biography of Thomas J. Clark	432
Biological Control	404
Bluetongue Research	374
Brucellosis Research	373, 409, 412
Budget:	
Impact of CSRS Reductions on ARS	421
Priorities, 1987	351
Request, Fiscal Year 1987	352
Catfish:	
Breeding	401
Research	395
Cherries Research	397
Commodity Conversion and Delivery	324, 368-370, 407, 420
Completed Research Projects	366
Congressional Directives, Response to	327
Contingency Research Fund	371
Cooperative Research	325
Cooperative Tropical Animal Disease Program	344
Corn Cyst Nematode	395
Cornstalk Borer (Lesser), Mole Cricket, and Diaprepes	405
Cotton:	
Ginning Process, New	371
Research	415
Critical Industrial Materials, Crops for	430
Crops of Strategic Value	429, 430
Cucumber	408
Current Research Programs (Dollar by Objective)	354

	Page
Dairy:	
Forage	400
Products, New Markets for	368
Diaprepes, Mole Cricket, and Lesser Cornstalk Borer	405
Energy Research Centers	393
Exotic Disease Research	411, 414
Explanatory Notes	448
Export:	
Barriers, Research to Eliminate	426
Remove Barriers to Commodity	369
Extension Research	325
Facilities:	
Buildings and	361
Research (New Lab. Space Acquired)	393
Research (Percent Used and Staff Assigned)	388
FDA, Liaison with ARS	421
Fire Ant	374
Food Toxicology	346
Fruit Fly Attractant Research	403
Fruit Research	402
Gene Transfer and Germplasm Enhancement	372
Germplasm Repository, Hawii	426
Gramm-Rudman Reductions, Effect of	421
Grasshopper Research	395
Guayule Research	394
Hawaii:	
Facilities, ARS Staff at	428
Germplasm Repository	426
Heliothis	406
Hops Research	403
Human Nutrition Research	375
IR-4 Research (Minor Use)	375
Impact of CSRS Reductions on ARS	421
Imported Fire Ant	374
Increased Usage for Agricultural Products	420
Integrated Pest Management	404
Irradiation Research	411
Japanese Beetle	377
Lactose Intolerance	417, 419
Land Grant Colleges, Universities	349, 411
Lane, Oklahoma, South Central Research Center	410, 413
Leafy Spurge	403
Lightly Processed Fruits and Vegetables	370
Locations:	
Overseas	396
Principal Types of Research by	378
Minor Use (IR-4 Research)	375
Mole Cricket, Lesser Cornstalk Borer, and Diaprepes	405
Mosquito, Lethal Genes	428
National Academy of Science Report	411, 414
National Agricultural Library	326
National Arboretum	400
National Sedimentation Laboratory (Oxford, MS, Yazoo Basin)	399

	Page
New Farm Programs	325
New Products from Corn, Wheat, Cotton, and Soybeans	324, 369
Objective, Current Research Program by	354
Office of Technology Assessment Report	340
Opening Remarks	323
Organic Agriculture	407
Other Services	368
Overseas ARS Locations	396
Peach Research	400
Peas and Lentils	404
Personnel:	
New Talent	406
Staff Year Increases	353
Temporary Employment	367
Pickle, Onion, and Carrot Research	349
Plan:	
ARS Research	414
Six Year	422
Plant Gene Expression Center, Status of	408
Post Doctoral Students	406
Potato Research	347, 377
Poteau, Tick Research Facilities At	414
Principal Types of Research by Location	378
Priorities, Research	350
Pseudorabies	394
Quarantine:	
Alternative Treatments, Task Force on	425
Treatment Research	424
Ratoon Stunting in Sugarcane	430
Recombinant DNA	342
Reimbursements:	
Industry Contributions	363
Miscellaneous	358
Obligations From Other USDA Appropriations	356
Other Federal Funds	357
Research Accomplishments	355,417
Rice Research	403
Rural America	350
Science and Technology Initiative	326
Small Farms, Impact on	341
Small Grains Research	397
South Central Agricultural Research Center at Lane, OK	410, 413
Soybean Oil	371
Statement:	
Dr. Bentley	434
Dr. Kinney	326, 439
Strategic Crops	429, 430
Sugar Crops:	
Sugarbeet and Bean Research	348
Sugarcane Pollen, Storage of	430
Sugarcane Research	430
Sugarcane, Ratoon Stunting in	430
Sunflower Research	402

Page

Technology:
Technology Transfer 340, 343
Transfer of Information 342, 418
Tobacco 372
Tri-fly Research 401, 424
Tropical Animal Diseases—Cooperative Research 344
Tropical/Subtropical Research 405
Unobligated Balances 358
Walnut Research 398
Yazoo Basin (National Sedimentation Lab., Oxford, MS) 399

Commodity Futures Trading Commission

Agricultural Advisory Committee 43, 46
Agricultural Options 12, 13, 30, 44
Audit Trail 2, 5, 6, 9, 32, 49
Boiler Room Fraud 25, 30
Budget Request 1, 42
Capital Rule Requirement 11
Common Types of Fraud 15
Congressional Liaison 45
Consultants 47
Contract Approval Process 4
Contract Market Designations 4
Cooperative Extension Service 44
Customers' Funds Protected 16, 32
Educational Meetings 62, 64
Effect of Embargoes 19
Farm Bill 61
Farmers' Use of Options 63, 64
Firm Failures 45
Freedom of Information Act 47
Futures Trading Information 46
Gramm-Rudman 47
Growth of Futures Options 31
Impact of Farm Economy 30
Interest Rates 12
Legal Counsel 47
Lie Detector Testing 8
Low Volume and Dormant Contracts 5
Market Surveillance 64
National Futures Association 25, 45, 54
Option Pilot Program 63
Reauthorization Process 2
Self Regulation 16, 17
Sequencing Trades 6
Staff-Year Reductions 32, 42, 61
Timing of Trades 17
Transfer of Registration 19
User Fees 7, 43
1890 research facilities 714
Agricultural policy institute, Iowa and Missouri 700
Alternative cropping systems in the Southeast 705
Animal health research 684, 741
Animal health and disease research 715

Page

Apple quality research, Michigan 708
Aquaculture planning grant, Hawaii 708, 747
Aquaculture research 686, 747
Acquaculture research, Stoneville, Mississippi 685
Asparagus yield decline 698
Bean and beet research 683
Biocontrol of grasshoppers 699
Biographical sketch—William D. Carlson 580
Biomass from diary processing waste, Missouri 701, 743
Biotechnology research 582
Blueberry shoestring virus 689
Brucellosis research 756
Competitive research grants 616, 743, 755
Consultants 719
Cooperative forestry research 720
Cranberry/blueberry disease and breeding, New Jersey 704
Critical Agricultural Materials Act 732
Crops for critical industrial materials 749
Dairy and beef photoperiod 685
Dairy goat research 694
Dried bean research, North Dakota 674
EDB replacement 703, 746
Explanatory notes 759
Fiscal year 1987 budget request 581
Food systems research group, Wisconsin 675
Fort Stanton experimental station relocation, New Mexico 712
Fruit and vegetable production and marekting, Kentucky 709
Germplasm resources research 687
Gulf coast shrimp research 714
Hatch Act 736
Higher Education:
  Graduate fellowships 744, 757
  Programs 733
  Strengthening grants 719
Integrated pest management 676
Integrated production systems, Oklahoma 696
Integrated reproduction management, Nebraska 704
International livestock program, Kansas 711
Maple research, Vermont 706
Michigan projects 738
Milk consumption, Pennsylvania 710
Minor use animal drugs 679
Mosquito research, riceland agroecosystem 690
National pesticide information retrieval system 732
Native Latex Act 713
New users of agricultural commodities 734
Northern Marianas 718
Object classification 732
Peach tree short life 688
Pest management programs 737
Pesticide clearance 678
Pesticide impact assessment 680
Plant stress 709
Potato research 697

Page

Preservation and processing research, Oklahoma 697
Rangeland research 713
Research:
  Planning 733
  Quality 734
Rural development centers 681
Shrimp research 748
Small business innovation:
  Development Act 721
  Research grants awarded 722
Soil erosion research in the Pacific Northwest (STEEP) 673
South Central research center 752
Soybean cyst nematode 682
Special research grants 581, 673, 736
Statement—John Patrick Jordan 570
Stone fruit decline 702
Stored grain insects, Kansas 711
Sugarland use research 695, 751
Sunflower insects 692
TCK smut 691
Tropical and subtropical research 693, 745
Warmwater aquaculture, Mississippi 712
Wood utilization research 707
Wool research 700

Economic Research Service

Break Even Price 196
Cash Flow for Farmers 196–197
Conservation 207–209
Dairy Program 206–207
Economic Implications of Alternative Methods of Certificating Dockage in U.S. Wheat 297–321
Economic Policy 198–202
ERS Imput Into Current Farm Programs 195
ERS Studies 202–203
Explanatory Notes 227–252
Farm Credit 203–204
Farmland Purchasers 202
Financial Conditions of Farmers 194–195, 203
Food Needs and Availabilities Report 206
History of Rural and Agricultural Policies 206
Language Changes 209
Low Interest Rates 192–193
Newsline 198
Opening Statement 189–191
Pesticide Study 193, 253–278
Potential Ban of Corn and Soybean Pesticides 253–278
Poverty in Rural Areas 205–206
Prepared Statement by John E. Lee, Jr 211–226
Relocation of ERS 197
Research Needs 207
Tax Policy 204–205
Transfers of Funds 209–210
Users Fees 197–198

Page

Wheat and Corn Prices 197

Extension Service

4-H:
- Enrollments 854-857
- Programs 878-879

Witnesses:
- For USDA 827
- Introductions 829-830

Budget:
- Extension 830
- 1987 831
- Reductions 832
- Elimination of Earmarks 832
- Funding Requests 832-833
- Agent Salaries 873-874
- Budget Proposals 880-882
- State and Local Funding 874-874, 878

Extension Service:
- Area of Emphasis 830-831
- High Priority Concerns 831
- Future of Extension 874
- ES 1986 vs. 1981 874

EFNEP:
- Impact of Funding 853
- Nutrition programs 869-876
- Need for 875-876
- Success of 883
- Needs of farm operators 885

Renewable Resources Extension Act 857-858, 877-878
Urban Gardening 853-854, 876
Rural Devlopment Centers 861-862 883-884
Farm Safety 859-860
Integrated Pest Management 863-864
Pesticide Impact Assessment 858-861
Home Economics 861
Extension and 879-880
Volunteers 864-865
Reimbursements 865-867
Rural Clean Water Program 868-869
Financial Management:
- Farm Financial Management Assistance 833-852, 870, 876-877

Transferring Research Knowledge 870-873, 880

National Agricultural Library

Assistance to the Food and Agricultural Organization 945
Collection Preservation 943
Contractual Service 945
Director's Statement:
- Highlights 935
- Prepared Statement, Joseph H. Howard 947

Explanatory Notes 952
Facility Needs 941
Feed Composition Data Bank 944

	Page
Information Center	943
Land Grant Libraries	937
Opening Remarks	935
Recommendation of the Blue Ribbon Panel	940
Regional Document Delivery System	941

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